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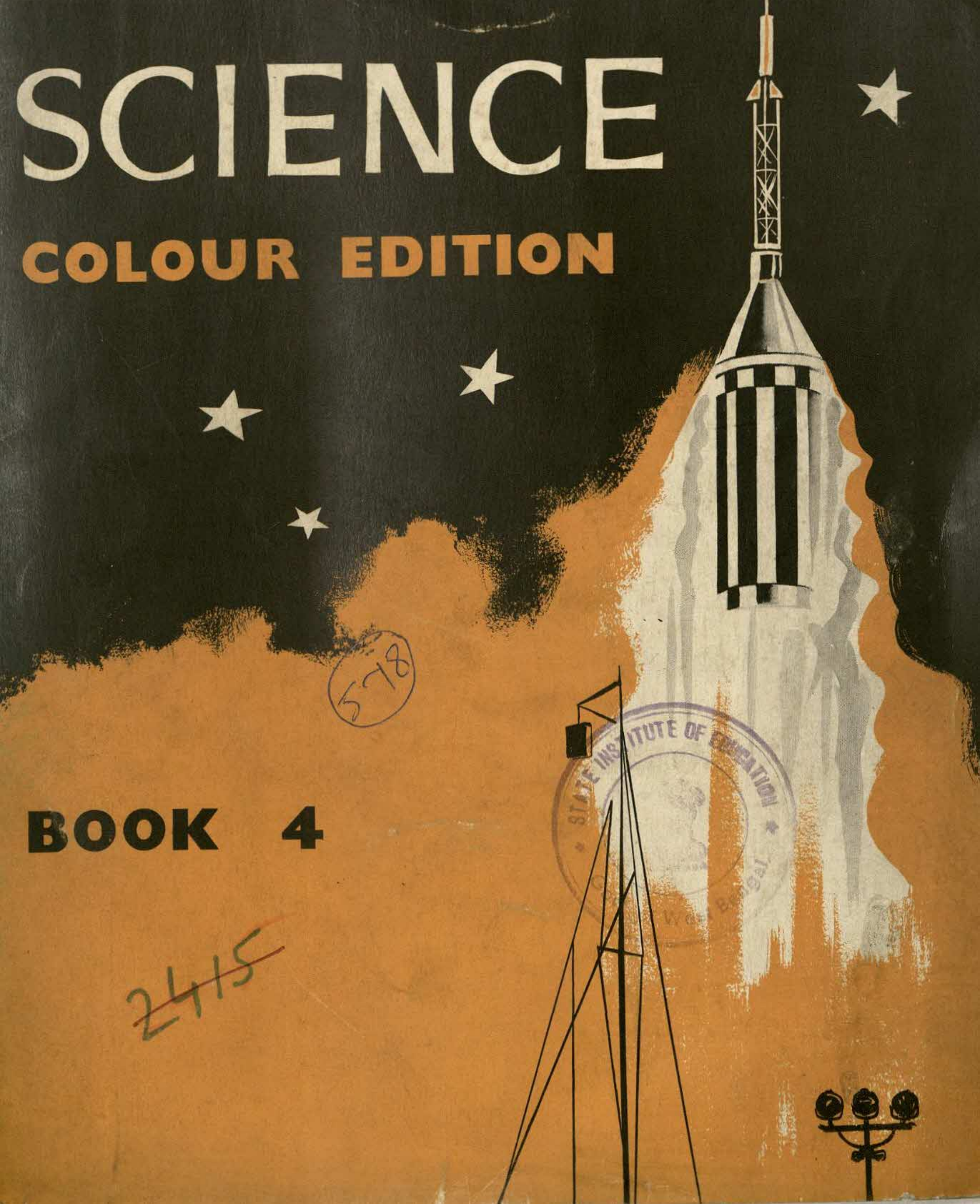
COLOUR EDITION

BOOK 4



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FOR INDIA

BOOK 4

Adapted for India

by

V. N. Narawane, M.Sc., M.Ed.

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All the books contain 'things to do' or practical experiments to perform. Questions are included at the end of each lesson or chapter.

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CHAPTER I

THE EARTH

The earth is round like an orange. It is made up of three main things: the land, the water and a layer of air that surrounds the earth. This layer of air is called the **atmosphere.** Animals and plants live on the land, and reptiles, fish and plants in the water.

Much of the earth is covered by water; the rest of it is land.

Motor cars, bicycles, cows, goats and other animals move on land; boats, ships, fish move in the water; aeroplanes and birds fly in the air.

We know very little about the sea, but we do know a great deal about the land.

Here is a drawing of the earth. Write the words **land, sea,** and **atmosphere** on the lines. Colour the land brown and the sea blue.

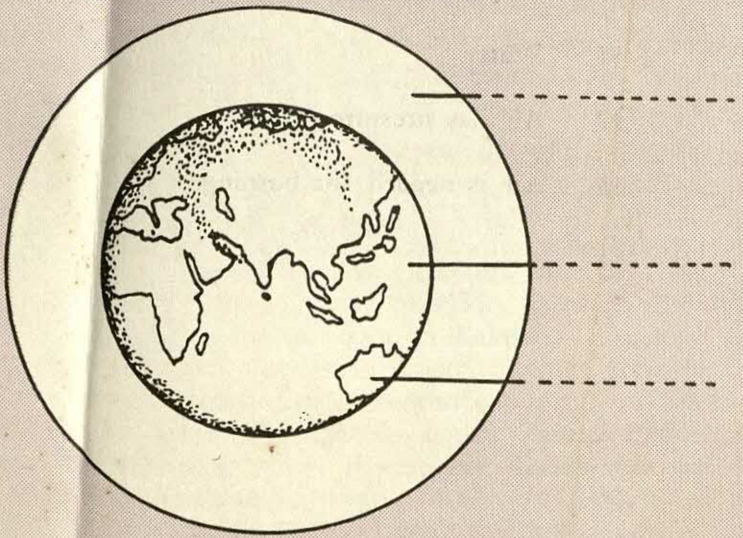

Fig. 1

EXERCISE Fill in the blanks below:

1. The layer of air that covers the earth is called the ....
2. Name two animals that live on land (a) .... (b) ....
3. Name two animals that live in water (a) .... (b) ....
4. Name two things that move in the air (a) .... (b) ....

THE SUN

The sun consists of very hot, flaming gases. It gives off heat and light. The heat and light have to travel a very long way before they reach us. This is because the sun is 150,000,000 kilometers away from the earth.

Those of us who live in the tropics get sunlight the whole year round, but those who live North or South of the Equator do not get so much sunlight.

Heat from the sun is very useful. It keeps us **warm.** It dries our clothes. It helps to break up rocks into small pieces, and these become **soil.** If there were no sun, there would be no day and night. We should all be in darkness. No animals or plants would live.

THE SUN GIVES US DAY AND NIGHT

As the earth is spherical, only half of it faces the sun. Sunlight falls on the half that faces the sun, and this is day. The other half that is away from the sun has no sunlight at all. This is night.

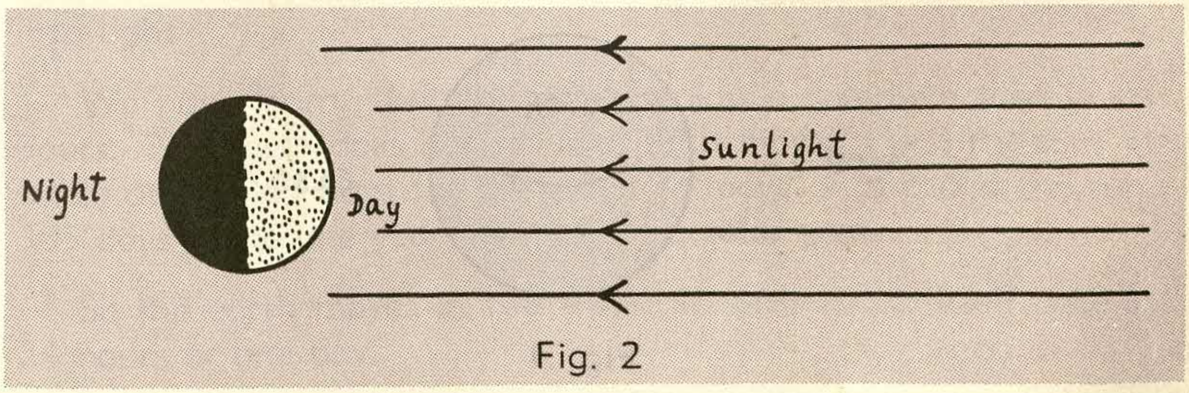

Fig. 2

EXERCISE

1. What does the sun give us? ....
2. How far is the sun away from the earth? ....
3. What would happen if there were no sun? ....

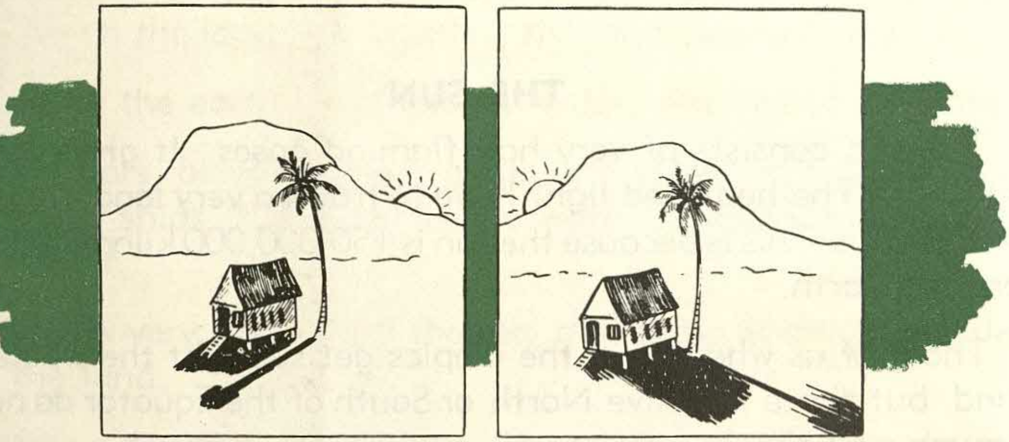

Fig. 3

In the morning the sun is in the **East.** At first the sun is low in the sky. Slowly it rises higher and higher. At noon, the sun is over our heads. Slowly the sun goes down and sets in the **West.**

Is it true that the sun moves from the East to the West? No, it is not true. What really happens is that the **earth** moves from the **West to the East.** As the earth turns we have the day and the night. It takes 24 hours for the earth to make one turn.

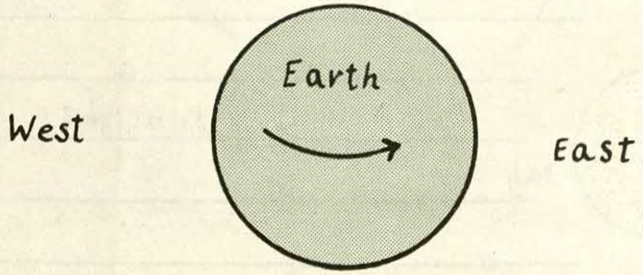

Fig. 4

EXPERIMENT I

Things to get: A globe or a big white ball, and a torch.

Things to do:

1. Write on a strip of paper the word 'day' and on another the word 'night'.
2. Shine the torch on the globe or ball. Place the paper marked 'day' on the bright side, and 'night' on the side that is away from the light.
3. Slowly spin the globe or ball from the west to the east.

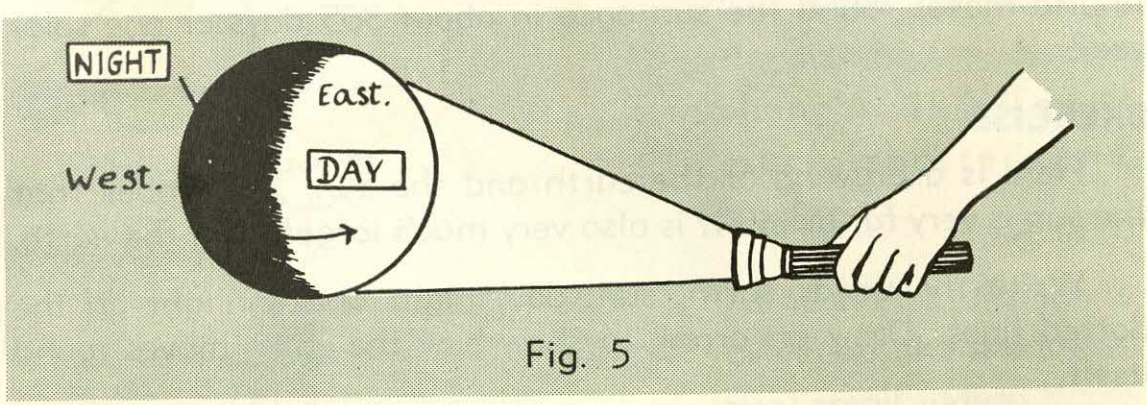

Fig. 5

What happens to the side that was day when the globe or ball has moved $\frac{1}{4}$ of a circle? Half of it has moved into darkness.

Keep on spinning the ball slowly.

What happens to the part that was night, when the globe or ball has made half a turn? All the part that was dark has moved into light

We have learnt that the earth makes a complete turn in 24 hours. The earth does not stand still. It moves round the sun. It takes about 365 days for the earth to move once round the sun. 365 days make one year. We call it a **solar year.**

So the earth moves in two ways. It turns round itself once in 24 hours or one day.

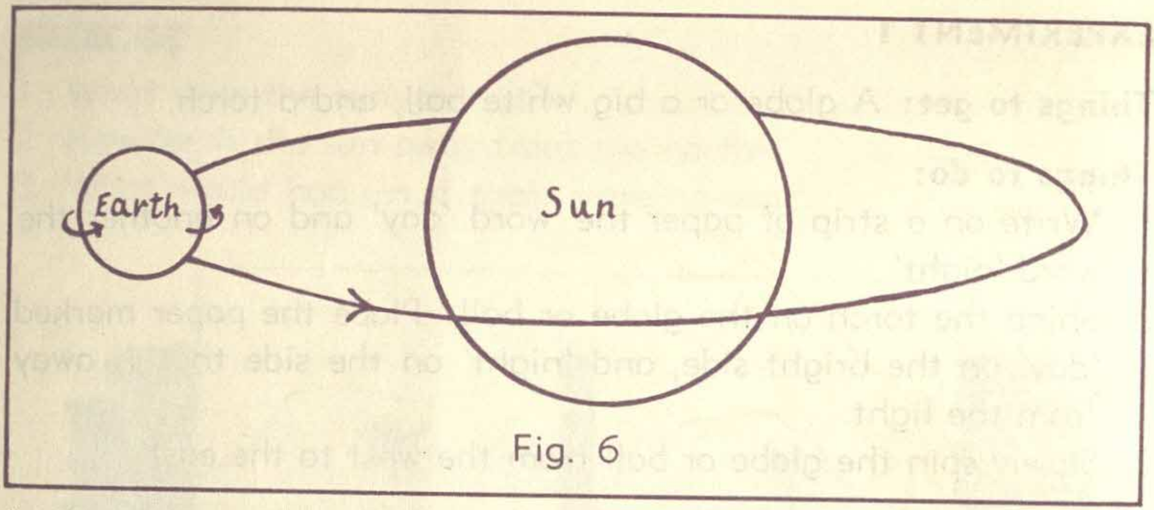

Fig. 6

It also moves round the sun once in about 365 days or one solar year.

EXERCISE

Here is a drawing of the earth and the sun. Remember that the sun is very far away. It is also very much larger than the earth.

Write the words earth, sun, day, night and sunlight on the dotted lines. Draw an arrow to show how the earth moves round itself.

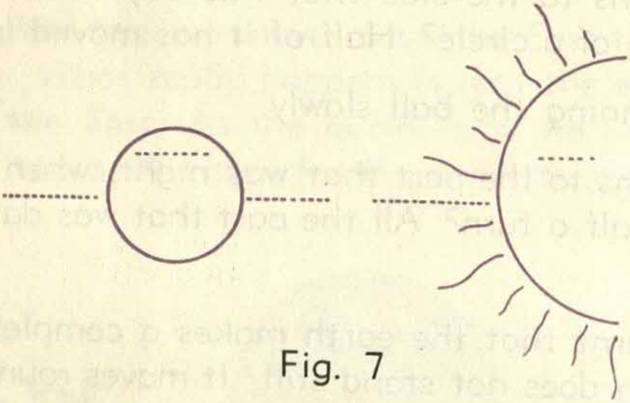

Fig. 7

Fill in the blanks:

1. The earth is .... away from the sun.
2. The sun looks small because it is .... from the earth.
3. It takes .... hours for the earth to turn round itself once.

4. Day and night is caused by the ....

5. The earth turns round itself from .... to ....

6. .... days make up a solar year.

In the morning when the sun is low in the sky, the shadow is long and big. As the sun rises higher and higher in the sky, the size of the shadow changes. It becomes much shorter and smaller.

At noon when the sun is overhead, the shadow is very small indeed.

In the evening when the sun goes down to the west the shadow becomes long again.

So you see, as the earth moves round, the length of the shadow changes.

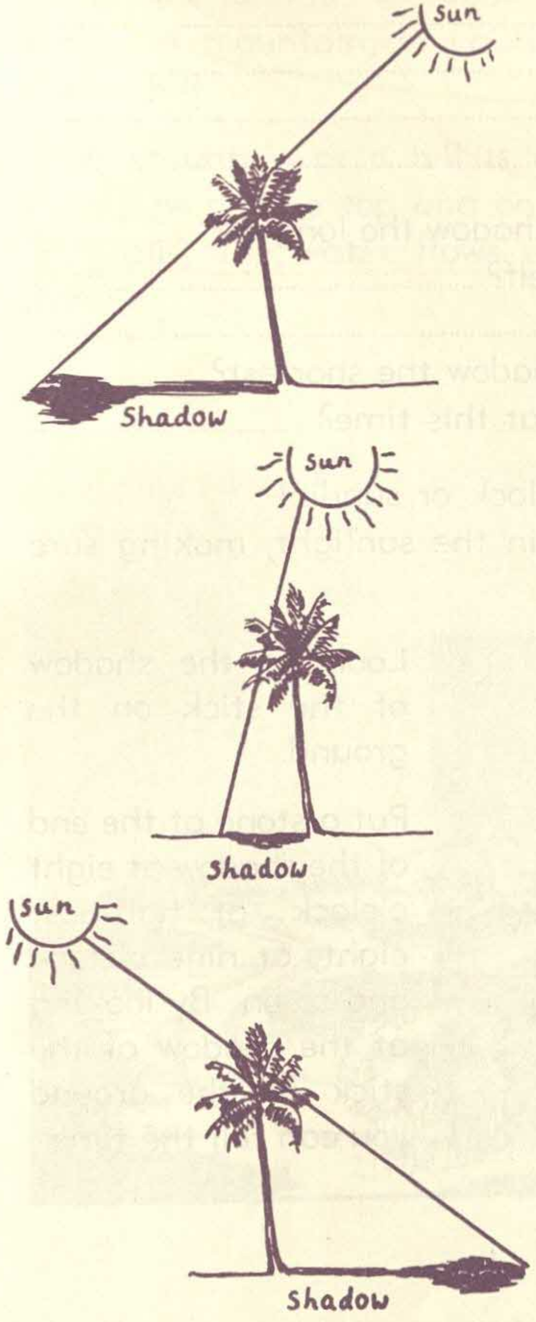

Fig. 8

Things to do:

Go out of doors and find out the length of your shadow.
Write your answers below.

My shadow at eight o'clock is ....
My shadow at ten o'clock is ....
My shadow at twelve o'clock is ....
My shadow at two o'clock is ....
My shadow at 4 o'clock is ....

1. At what time of the day is your shadow the longest? ....
2. Is the shadow longer than yourself? ....
3. By how much? ....
4. At what time of the day is your shadow the shortest? ....
5. Where is the position of the sun at this time? ....

Things to do: To make a shadow clock or sundial.

Get a stick. Fix it into the ground in the sunlight, making sure it is exactly upright.

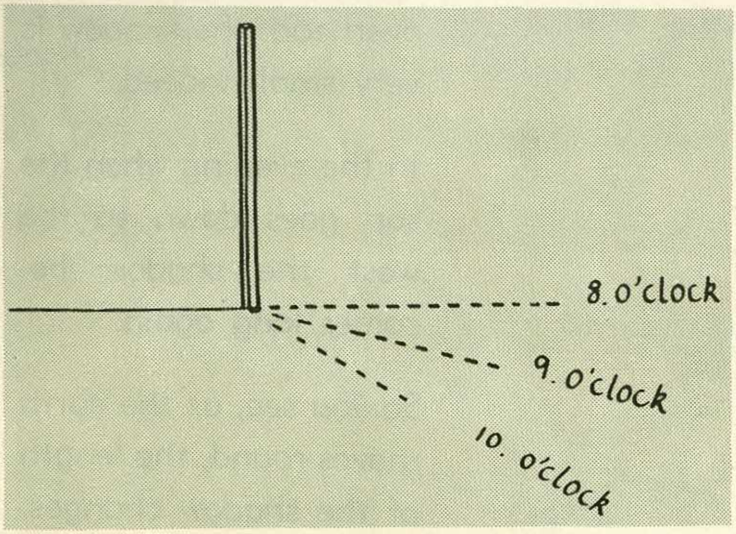

Fig. 9

Look at the shadow of the stick on the ground.

Put a stone at the end of the shadow at eight o'clock, at half-past eight, at nine o'clock and so on. By looking at the shadow of the stick on the ground you can tell the time.

CHAPTER 2

MORE ABOUT THE EARTH

In some places the land is flat. We call it a plain. In other places, the land is high above the ground. We call this high land a hill. A mountain, of course, is very much higher and bigger than a hill.

A mountain or a hill is usually made of **hard rocks.** Plants may grow on the top and on the slope of the mountain. When rain falls, the water flows down the hill to become rivers and streams.

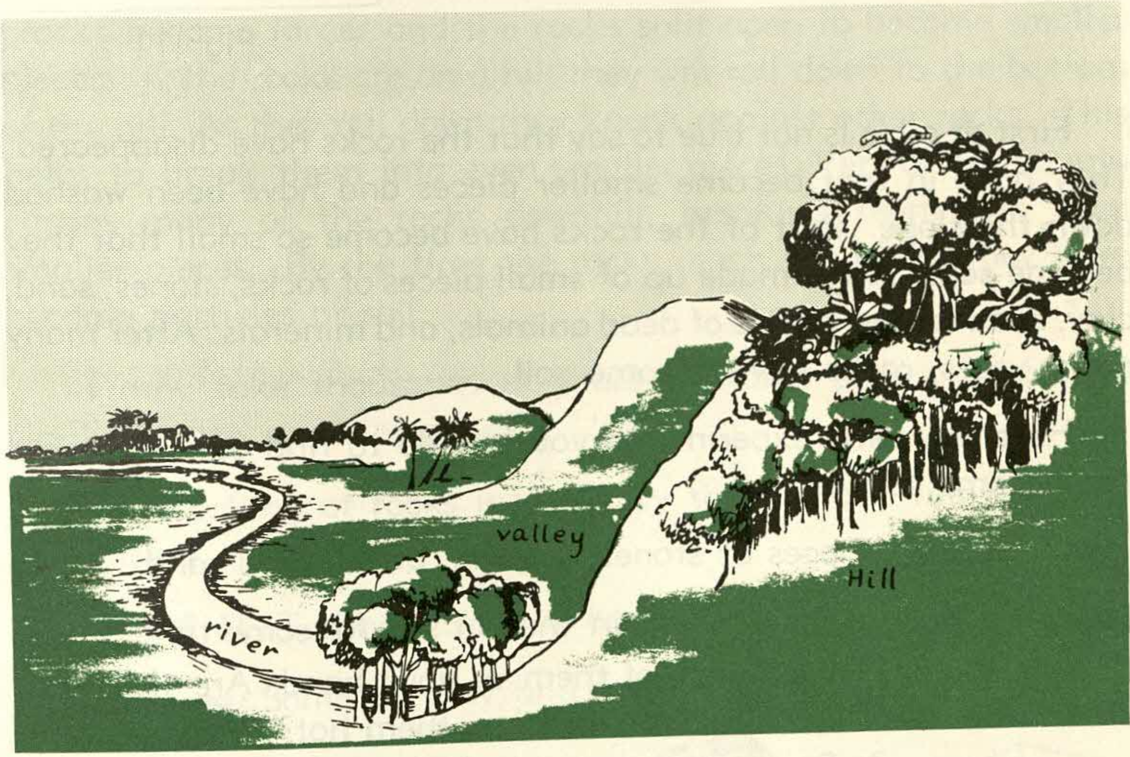

Fig. 10

The drawings here show you the slope of a mountain. There are many trees and plants growing on the mountain top and the slopes. There are rocks here and there. Some are huge pieces and some are small pieces. Plants grow in places where there is plenty of good soil.

After many years, the slope of the mountain looks different. Many of the trees and plants have died and new ones have grown. Many of the rocks have disappeared too. Where have they gone, you may ask? This is what we want to find out.

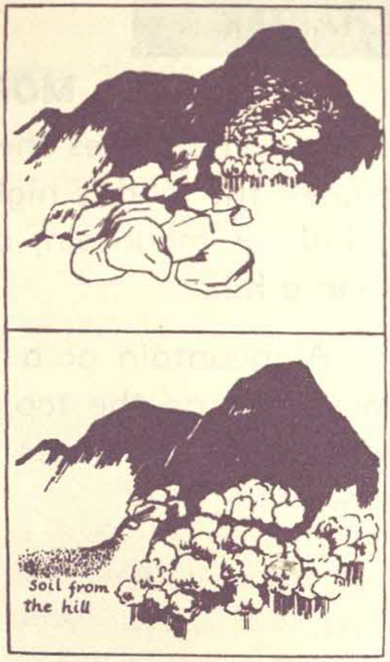

Fig. 11

First of all it is not true to say that the rocks have disappeared. They have in fact become smaller pieces and have been washed down the slope. Part of the rocks have become so small that they become **soil.** Soil is made up of small pieces of rocks, stones, sand, clay, dead leaves, bodies of dead animals, and minerals. After many many years, rocks have become soil.

Here are some experiments you can do to find out how rocks can become soil.

Things to get: Pieces of stones, granite, bricks, and sand.

Things to do:

1. Leave these in the hot sun for some time.
2. Hold each of them in your hand. Are they hot? .... What makes them hot? ....
3. Pour water on to the hot pieces of stones, granite, bricks, and sand.
   Do you hear any hissing sound? ....
   Why do they give out such a hissing sound?

4. Pour water from a watering-can on a heap of soil.
   Where does the water flow?

   ....

   Does the soil from the top flow down to the bottom? ....

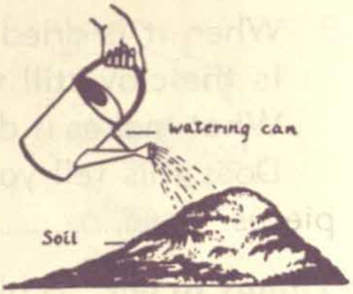

Fig. 12

What helps the rock to become soil?

Many things help to make the rock break up into soil. One of the most important is the sun. The sun gives us light and heat. The light enables us to see things and the heat keeps us warm. During the day, the rock becomes very warm because of the heat of the sun. During the night the rock becomes cooled. The change from hot to cold makes the rock crack. After many years, the cracks become larger and the rocks split open to become smaller pieces. If the rocks are on a hill they will roll down to the bottom of the hill. As they roll down they knock against other rocks. This helps to break them into even smaller pieces. Very often the rain carries many of the rocks downhill, breaking them into even smaller pieces. By the time the rocks reach the plain, they have become particles of soil.

It may take thousands of years for large pieces of rock to break up into particles of soil.

The breaking of rocks into soil by the sun and rain is called **weathering.**

EXPERIMENT To find if clay will crack.

Things to get: Some wet clay, and a biscuit-tin cover.

Things to do:

1. Spread the wet clay in the tin cover.
2. Leave it in the sun for a week.

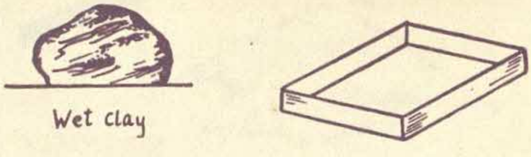

Fig. 13

3. When it is dried take a look.
Is the clay still wet after a week? ....
What makes it dry? ....
Does this tell you that the sun helps to break clay into small pieces? ....

Things to get: A glass of water, some ice cubes, and boiling water.

Things to do: Put some pieces of ice into the glass of water. Leave it for 10 minutes. What is seen on the outside of the glass?

2. Pour away the ice water. Now quickly fill the same glass with boiling water from a kettle.

Does the glass crack?

EXERCISE Fill in the blanks.

1. The two things that help to break up rocks are the .... and ....
2. All kinds of soil come from ....

CHAPTER 3

A STUDY OF SOILS

We have learnt that all kinds of soil come from rocks. Soil is made up of pieces of sand and clay of different sizes. Some soil contains rotten leaves. This makes the soil rich. If you examine the side of a hill that has been cut, you will find that it has two layers of soil. The layer that is nearest the surface of the ground is called the **top-soil.** This is usually only a few centimeters deep. It is often black because of the rotten leaves. Plants take food from this layer.

Below the top layer is called the **sub-soil.** This is often grey or red. This layer has little plant food. Beneath the sub-soil are rocks.

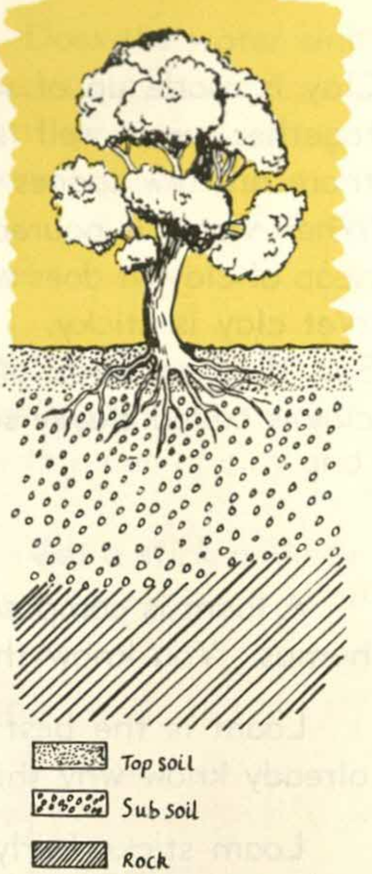

Fig. 14

TYPES OF SOIL

SAND

Sand is usually found on the beach or in a desert. Grains of sand are of different sizes. Some are large and some small; some are round pieces and others have rough edges. When water is poured on to a heap of sand, it sinks quickly. Some stays in the spaces between the grains of sand. These spaces also contain air. Soil that contains plenty of sand is called **sandy soil.**

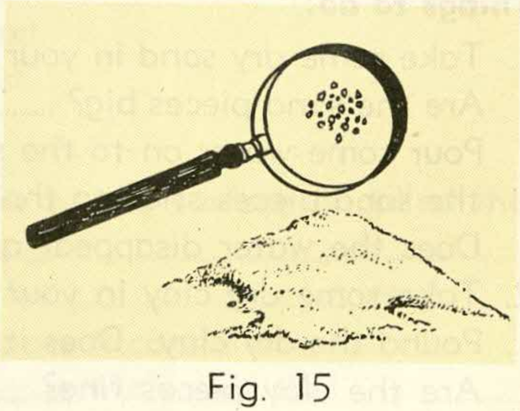

Fig. 15

CLAY

Clay is made up of very fine pieces of soil. These pieces stick together very well so that there are few spaces in clay. When water is poured into a heap of clay, it does not sink. Wet clay is sticky.

Soil that contains plenty of clay is called **clayey soil.**

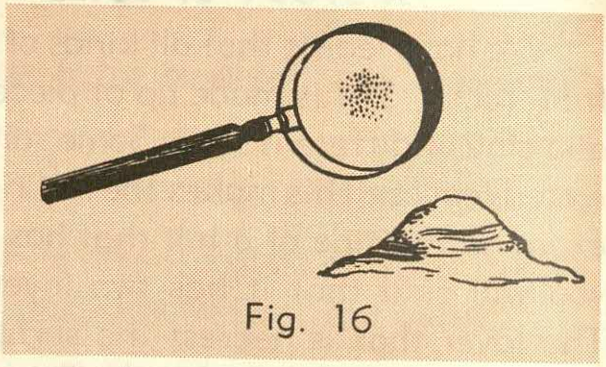

Fig. 16

LOAM

A loam is composed of a good mixture of sand and clay and humus. You know that garden soil and top soil are loam.

Loam is the best kind of soil for plants to grow in. You may already know why this is so.

Loam sticks fairly well together but it is not so sticky as clay. The soil particles stick together and the loam retains enough water for plants.

Loam contains plant-food because of the humus. The more humus it has the better is the soil. Rotten leaves make the loam rich.

Things to do:

1. Take some dry sand in your hand. Is it rough? ....
   Are the sand pieces big? ....
   Pour some water on to the sand. Take some in your hand. Do the sand pieces stick to the hand? ....
   Does the water disappear quickly? ....
2. Take some dry clay in your hand. Is it smooth? ....
   Pound the dry clay. Does it break up? ....
   Are the clay pieces fine? ....

Pour some water into a lump of dry clay. Does the water sink quickly? ....

Hold some wet clay in your hand. Is it sticky? ....

3. Take some garden soil. Is there much sand? ....

Is there much clay? ....

Hold a handful in your hand. Is it sticky? ....

Is it black? ....

Are there any dead leaves or pieces of stick? ....

4. Get three jam jars or bottles that have wide mouths, and a cup. Fill one bottle with a cup of sand, another with a cup of clay and the third with a cup of garden soil.

Pour a cup of water into each of the bottles. Get a stick and stir the contents. Leave them for some time.

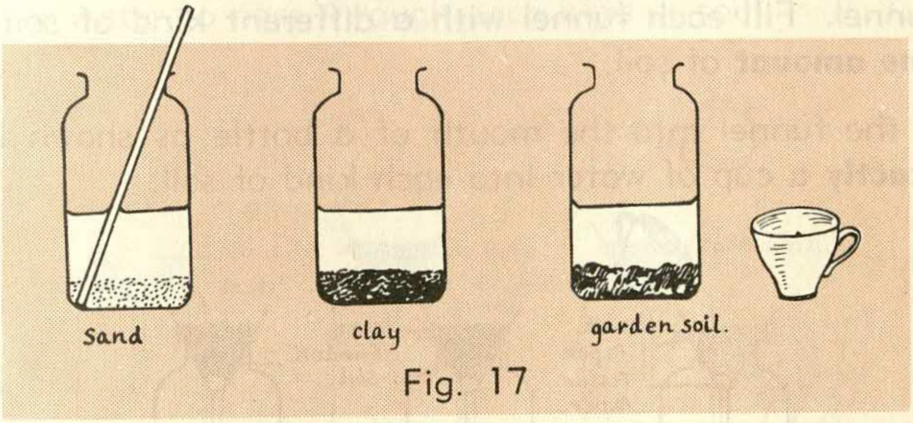

Fig. 17

Find out which kind of soil settles down first.

.... settles down first

.... settles down next

.... settles down last.

EXERCISE Fill in the blanks:

1. The layer of soil that is nearest to the surface is called the ....
2. The layer of top-soil is only a few .... deep.
3. Top-soil is good for plants because it contains ....
4. The layer of soil next to the top-soil is called the ....

5. Plants do not grow well in this kind of soil because it has little ....
6. Soil that contains plenty of sand is called .... soil.
7. Soil that contains plenty of clay is called .... soil.
8. Sandy soil has plenty of air because ....
9. Loam is made up of a mixture of .... and ....
10. It is .... that makes a soil rich.

EXPERIMENT 1 To find out how much water is held back by sand, clay and garden soil.

Things to get: Three funnels, three bottles, pieces of tissue-paper or cotton-wool, sand, clay, garden soil, and a ruler.

Things to do: Place tissue-paper or cotton-wool at the bottom of each funnel. Fill each funnel with a different kind of soil. Use the **same amount** of soil.

Put the funnel into the mouth of a bottle as shown below. Pour **exactly** a cup of water into each kind of soil.

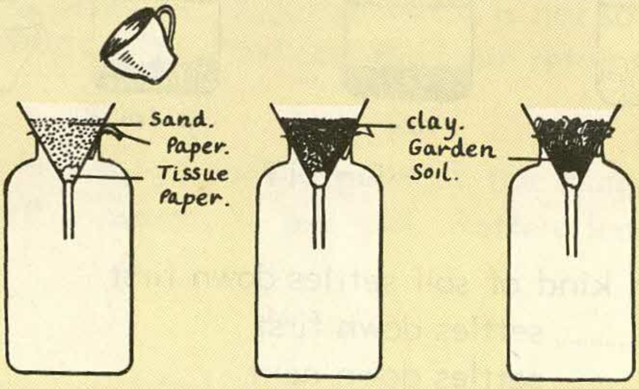

Fig. 18

Note the amount of water in each bottle.

.... centimeters of water was collected after it passed through the sand.

.... centimeters of water was collected after it passed through clay.

.... centimeters of water was collected after it passed through garden soil.

The experiment shows that
.... holds back the most amount of water.
.... holds back a lesser amount of water.
.... holds back the least amount of water.

EXPERIMENT 2 To find out how long it takes for water to pass through sand, clay and garden soil.

Things to get: As in Experiment 1. This time you need a watch.

Things to do: Place your tissue-paper or cotton-wool at the bottom of the funnel. Fill each funnel with a different kind of soil.

Put the funnel into the mouth of a bottle as shown below. Pour exactly a cup of water into each kind of soil. Note the time it takes for water to pass through each kind of soil.

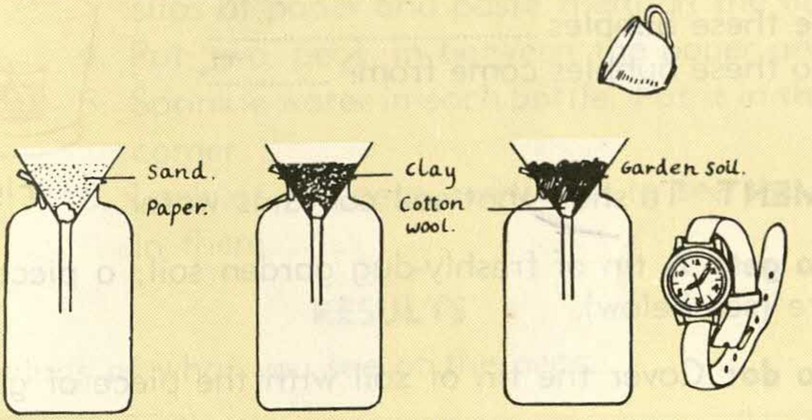

Fig. 19

It takes .... seconds for water to pass through sand.
It takes .... seconds for water to pass through clay.
It takes .... seconds for water to pass through garden soil.

This experiment shows that
Water passes fastest through ....
slower through ....
and slowest through ....

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AIR IN SOILS

We have learnt that soils have air spaces. These spaces can also hold back water. Sand has plenty of air spaces because sand is loose. Therefore sand holds back very little water. Clay has few air spaces because clay pieces stick together closely. Therefore clay holds back plenty of water. Loam or garden soil has a good number of air spaces. It holds back just enough water.

EXPERIMENT To show that soil contains air.

Things to get: A tin of garden soil, a pail of water and a stick.

Things to do: Fill a tin with garden soil. Press down the soil. Put it in the pail of water. Stir it with a stick and see what happens.

Do any bubbles appear from the tin of soil when you put it into the water? ....
What are these bubbles ....
Where do these bubbles come from? ....

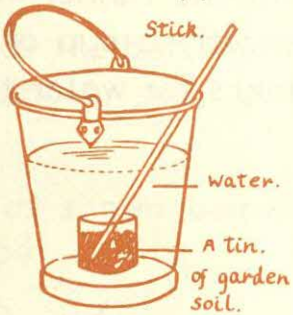

Fig. 20

EXPERIMENT To show that soil contains water.

Things to get: A tin of freshly-dug garden soil; a piece of glass, and a fire (see below).

Things to do: Cover the tin of soil with the piece of glass.

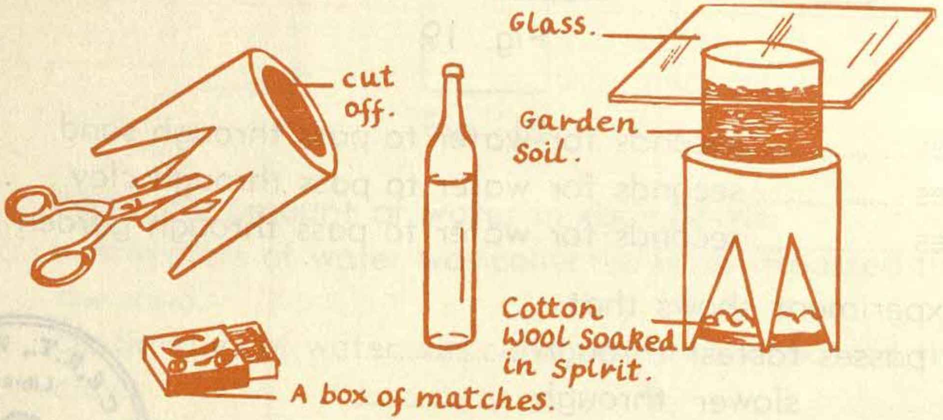

Fig. 21

Place it over a 'fire stand' and put a flame under it.
After some time look at the piece of glass.
Does anything appear on the underside of the glass? ....
What are these? ....
Where do these come from? ....

EXPERIMENT To find which is the best type of soil for growing peas.

Things to get: Three bottles, blotting paper, peas, sand, clay, and garden soil.

Things to do:

1. Put a piece of blotting-paper inside each bottle.
2. Fill the centre of each bottle with one of the types of soil and press down the soil.
3. Write the words **garden soil, sand** and **clay** on slips of paper and paste them on the bottles.
4. Put two peas in between the paper and glass.
5. Sprinkle water in each bottle. Put it in the nature corner.
6. Look at the peas every day to see the changes in them.

RESULTS

Make drawings of what you see of the peas.

Peas in the garden soil	Peas in the sandy soil	Peas in the clayey soil

Drawn here are some living things that live in the soil. Have you seen them before?

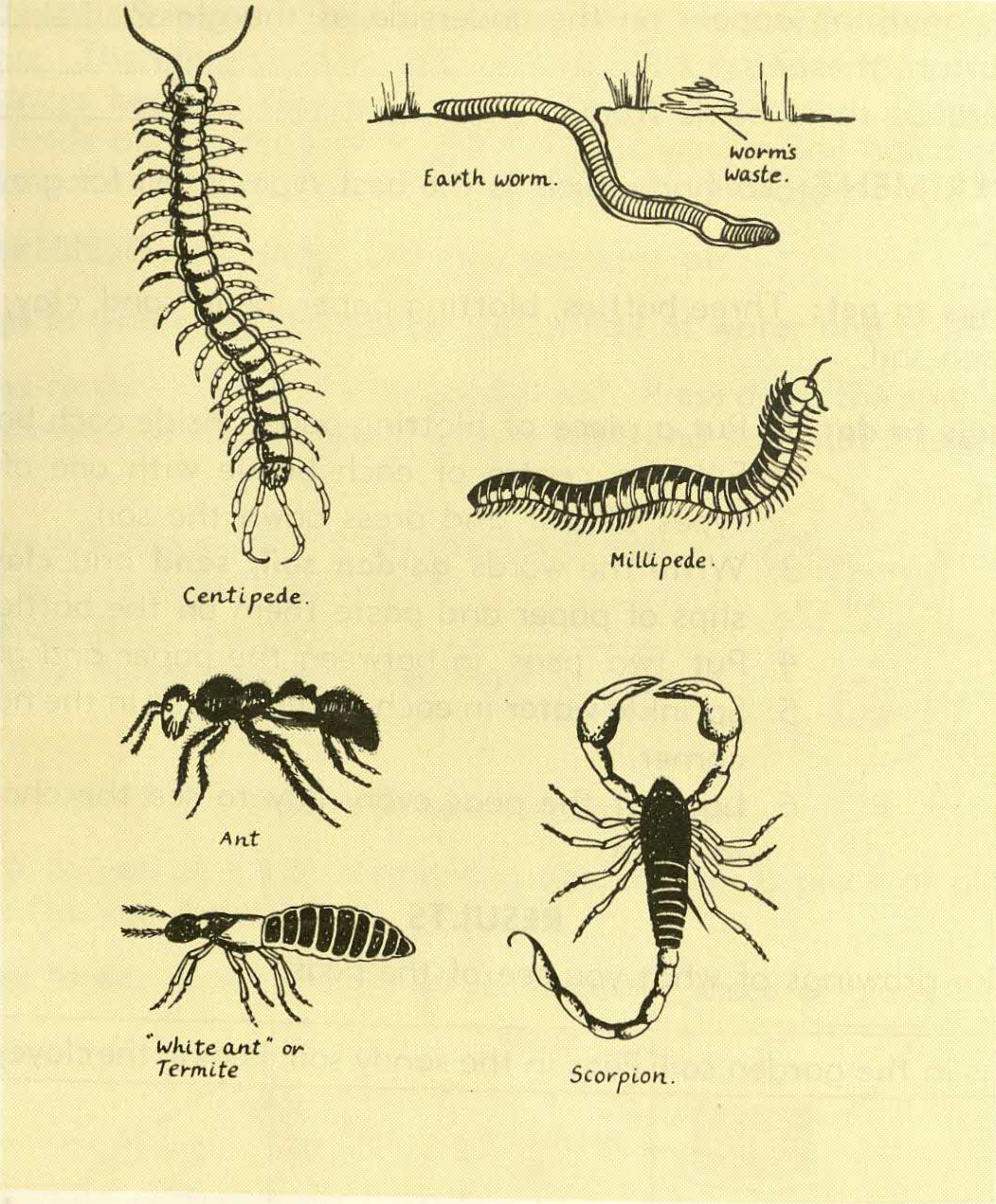

Fig. 22

Some of these animals live on the surface of the soil. Others live under dead tree-trunks. The earth-worm lives inside the soil These animals eat dead leaves, rotten tree-trunks and the bodies of other dead animals.

The most useful animal is the earth-worm. It makes its home quite deep in the soil. In the night it comes up to the surface to take in dead leaves. These it eats. It also comes to the surface to throw away waste. This waste makes the soil rich.

An earth-worm eats its way into the soil. As this goes on it makes a large number of tunnels under the soil. This helps to give air to the soil.

The way it goes from one place to another helps to mix the soil, so that the top-soil is mixed with the sub-soil. This makes the soil very **fertile.**

EXPERIMENT To find out how earth-worms make soil rich.

Things to get: A number of earth-worms, a bottle, leaves, yellow soil and black soil.

Things to do:

1. Put some yellow soil in the bottle first. Then put in the black soil on top.
2. Now put in the worms. Watch how they go into the soil.
3. Put some rotten leaves on top of the soil. Leave the bottle under some shade.
4. After a week or so take a look at the bottle of soil. Write your answers below.

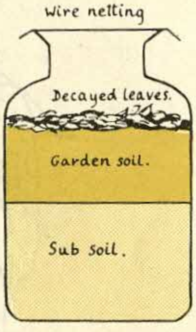

Fig. 23

Questions

1. What kind of soil is at the bottom? ....
2. What kind of soil is at the top? ....
3. How many earth-worms did you put inside? ....
4. Do the earth-worms stay on the surface? ....
5. Why do you think that you should put leaves on top of the soil?
....
6. After a week or so is the yellow soil mixed with the black soil?
....
7. Does this show that earth-worms help to mix the soil? ....

CHAPTER 4

FLOWERING PLANTS

Plants grow where there is soil and sunlight. These may be in the school compound, in your own garden or up in the hills and in the valleys.

Plants can be divided into two main types, one that bears flowers and another that does not. The first type is called **FLOWERING PLANTS,** the second is **NON-FLOWERING PLANTS.** In this chapter and the next, we shall study some common flowering plants and non-flowering plants. Try and bring these plants to school for your science lessons.

The first flowering plant we are going to study is the **Hibiscus.**

Different kinds of Hibiscus flower

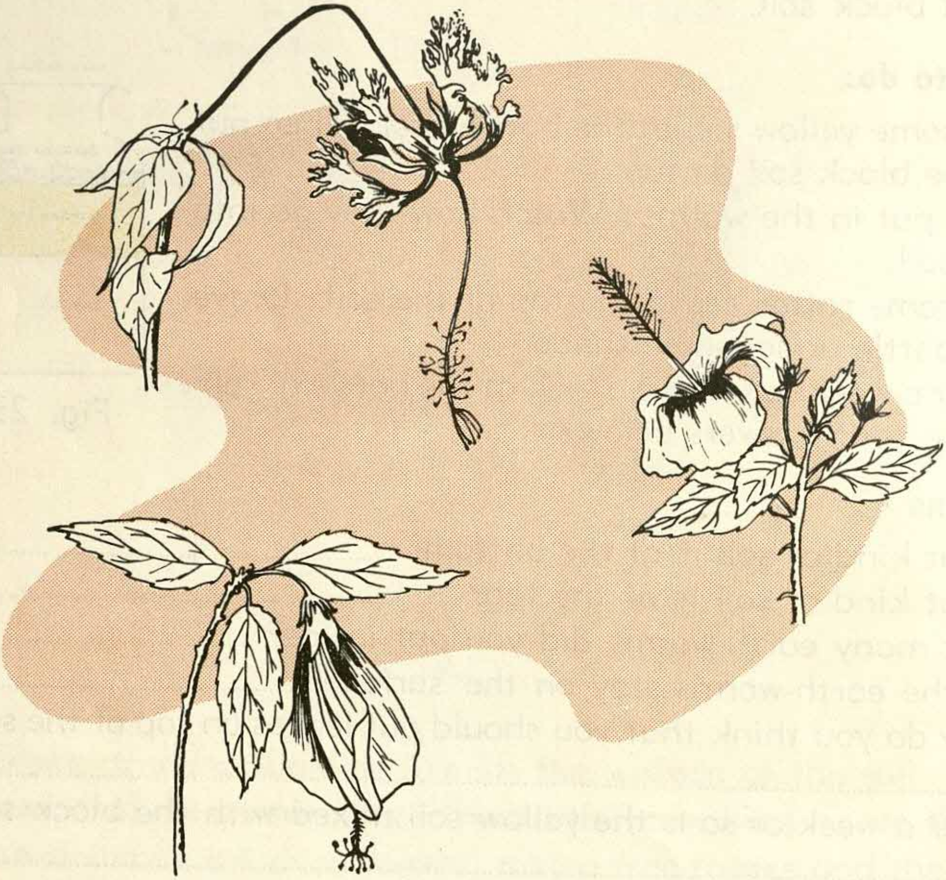

Fig. 24

The commonest Hibiscus is the **Hedge Hibiscus.** People grow this as a fence or a hedge.

It has large red flowers. The flower comes out between a leaf-stalk and the stem. It has a long green flower-stalk.

The leaves are dark green. Some of them are as big as a man's palm. The edges of the leaf are like the teeth of a saw. The leaf has a main vein and many side veins.

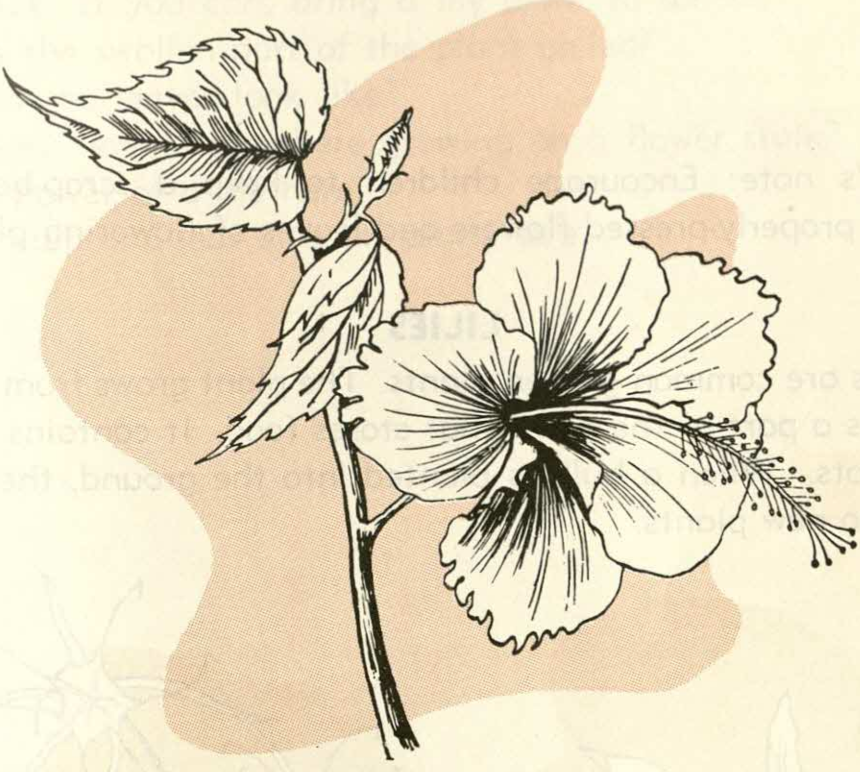

Fig. 25

We still do not know why the flower does not grow into a fruit. But we can grow a new hibiscus plant from a piece of stem.

Things to do:

1. Bring the leaves, flowers and stem of an hibiscus plant to school. Use a green colour pencil and do a leaf rubbing on a sheet of paper.
Paste it in the book.

2. Draw a diagram to show the parts of the hibiscus flower.

Teacher's note: Encourage children to keep a scrap-book for keeping properly-pressed flowers and leaves of flowering plants.

LILIES

Lilies are common garden plants. The plant grows from a **bulb.** A bulb is a part of the plant that stores food. It contains a stem and shoots. When a bulb is planted into the ground, the shoots grow into new plants.

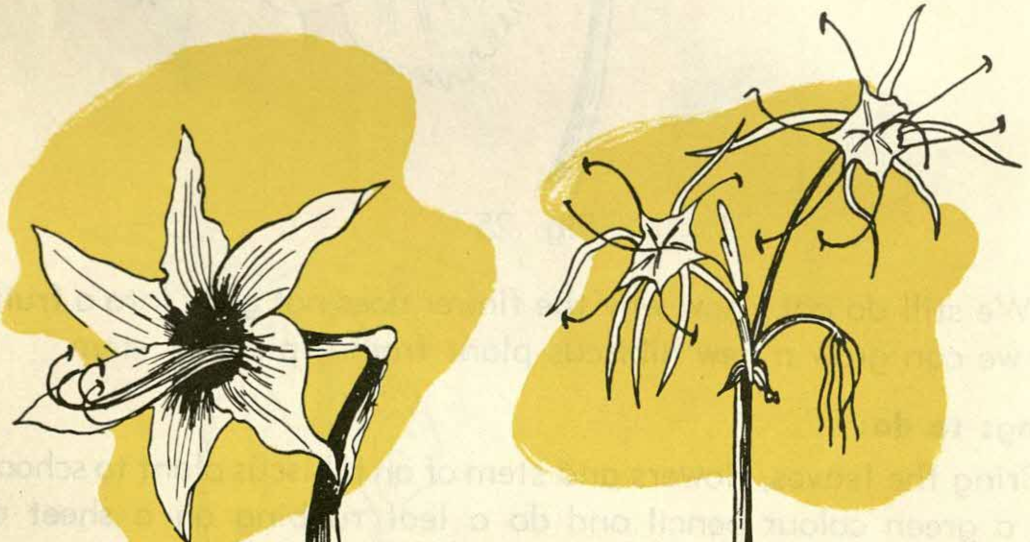

Fig. 26

A lily plant has few leaves. These are thick, and like the blade of a knife. The surface of the leaf is smooth.

A Red Lily has a trumpet-shaped flower; a Spider Lily has white flowers. A single Spider Lily plant has many flowers.

To grow lily plants we use the bulbs that are found underground. Another example of a bulb is the onion.

EXERCISE If you can, bring a lily plant to school.
What is the swollen part of the plant called?
What do the leaves look like?
How many flowers are there growing on a flower stalk?
Draw a flower of a lily here.
Draw a bulb and leaf of a lily plant here.

CANNA

The canna is a common garden plant. There are many varieties. There are red, pink, yellow and white, and a mixture of yellow and red.

Canna plants grow well in slightly damp soil that has plenty of humus. We often see the gardener cover the root part of the plants with the grass he cuts from the lawn. When this layer of grass rots it forms a good layer of humus. It will also keep the soil damp.

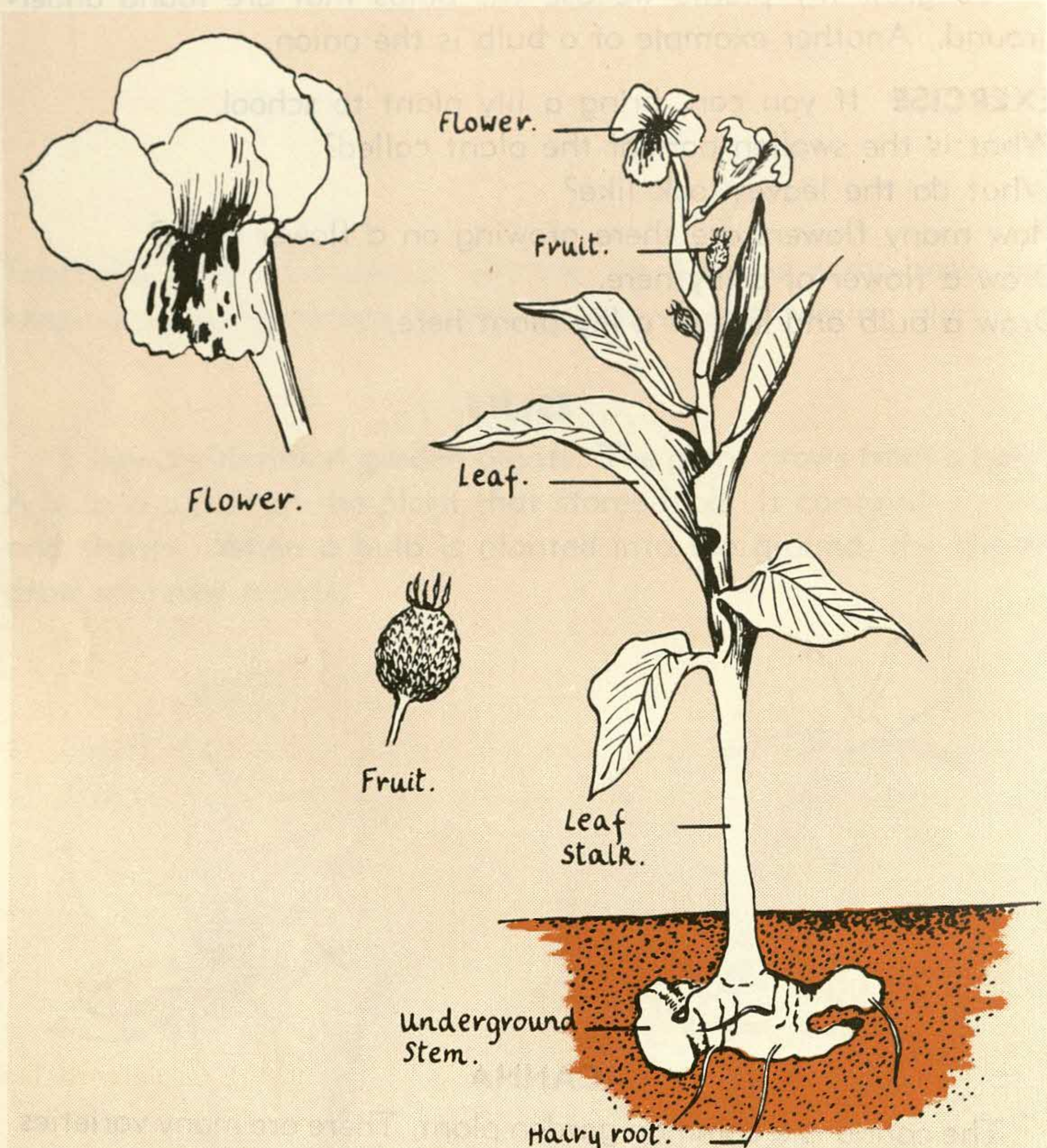

Fig. 27

The leaves are thick and long. The surface of the leaf is smooth. It has a main vein and many side veins.

The leaf-stalk is thick and juicy. The leaf-stalks wrap round one another. This makes up the 'stem', which is above the ground. The real stem grows under the ground. This kind of stem is called an **underground stem.** Therefore the canna plant has an underground stem. The stem has many roots.

The flowers are borne on the centre stalk. There are three to five flowers on a plant. When the flowers drop, fruit appears. The fruit is round.

A canna plant can be grown from a piece of its underground stem. The underground stem has young shoots. When it is planted in the ground, the shoots grow into new plants.

BOUGAINVILLEA

This is a common garden plant. It is bushy, and often has stems sticking out here and there. It is easy to recognise this plant because its stems have **sharp thorns.**

This plant has two kinds of leaves, large green ones and small coloured ones. It is the coloured ones that look like parts of a flower. If you pluck one and examine one you will find that each coloured leaf has a small thing sticking to it. This is the flower (see drawing below). The coloured leaf may be one of these colours—orange, red, yellow, crimson or purple.

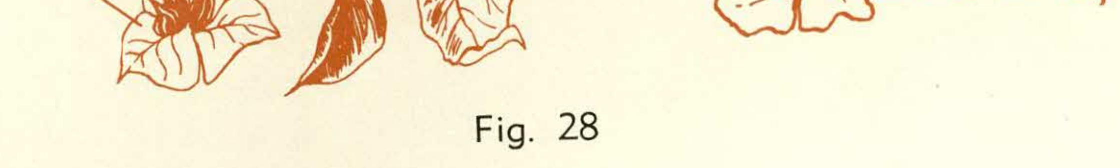

Fig. 28

Things to do:

Examine a Bougainvillea plant. Look for the thorns; look for the coloured leaves. Where are the flowers?

Draw the two kinds of leaves here.

Remove a flower. Draw the flower here.

EXERCISE A test.

1. The flowers of the hibiscus are .... (colour)
2. The edge of an hibiscus leaf is like the ....
3. The yellow powder is called the ....
4. An hibiscus plant can be grown from a piece of its ....
5. Lily plants grow from a ....
6. Draw a flower of the lily
7. The canna plant has underground ....
8. An underground stem has roots, leaves and young ....
9. The stem of the Bougainvillea has ....

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CHAPTER 5

MORE FLOWERING PLANTS

ORCHIDS

Orchids are common in the hills. Some of you may have some growing in your garden also.

There are many different types of orchids. Some of our Indian **orchids have won prizes at flower shows in various parts of the** world. Some of the well-known orchids are Zeuxine, Liparis, Vanda and Lady Hamilton.

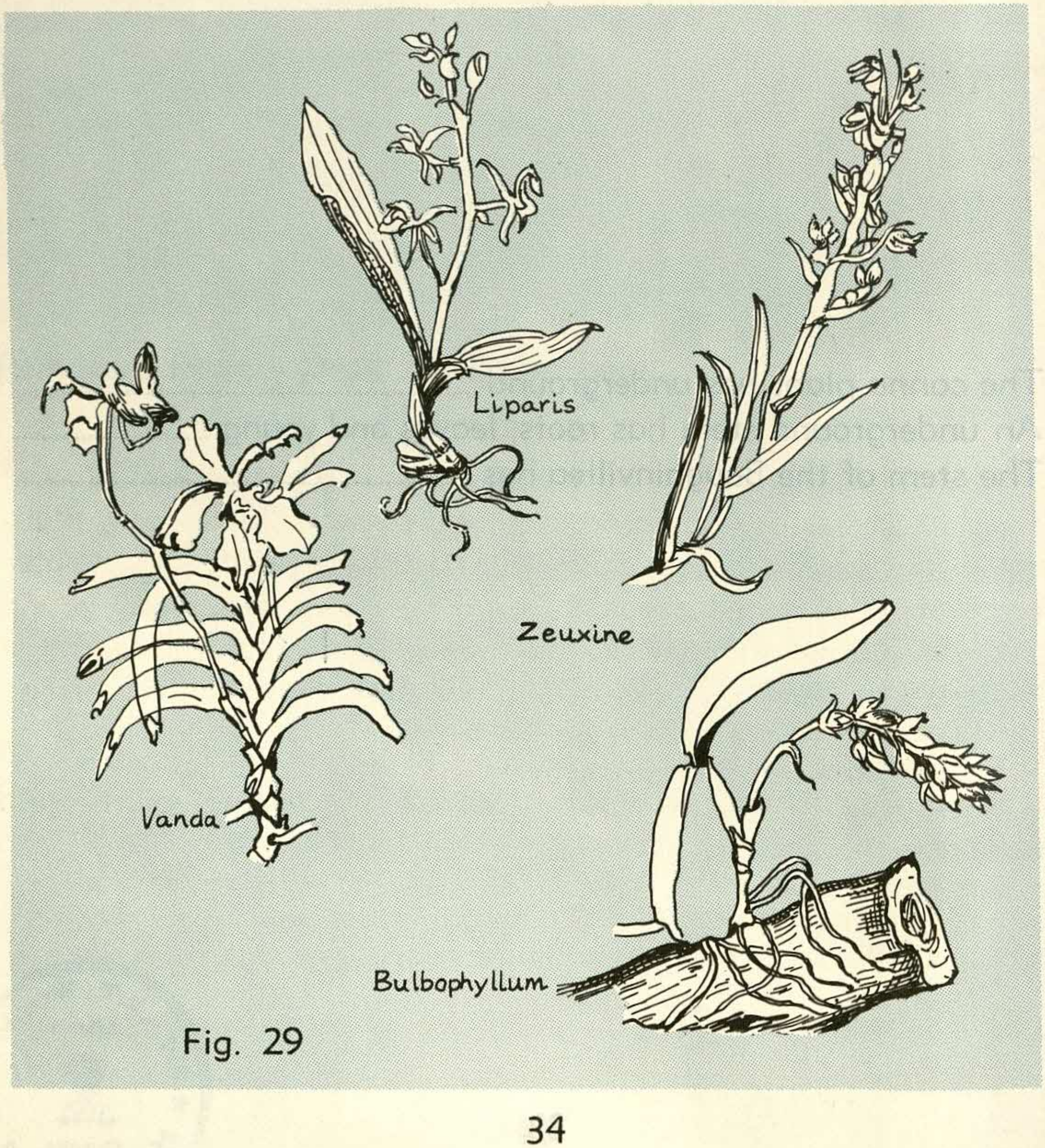


Fig. 29

The commonest type that is grown in gardens is the **Vanda Roxburghii.** Another common one is the Liparis, which grows on tree-trunks.

Orchids are wonderful flowers. A cut flower that is kept in a vase may last a long time.

One orchid may look different from another in colour and size, but all orchids have the same flower parts.

Most epiphytic orchids have **aerial roots.** These roots take in air and water and are above the ground.

Things to do:

Take some orchid flowers to school. Put them in a vase. See how long the flowers will last.

If you can, take an orchid plant to school. Look for the aerial roots.

What is the colour of these roots?

BALSAM

Do you know that it is very easy to grow some balsam plants? All you need is a box of garden soil and some balsam seeds. Place them in the soil and cover them with a thin layer of soil. Water them every day. In a few weeks' time you will have many young plants. If you want them to grow well, you should pull away the weak ones and dig out the strong ones. Then replant the strong ones so that they are not crowded together.

The balsam plant has a soft stem. It is thick at the base and thin at the top.

If you dig up the plant from the ground you can see its roots. There are many very fine roots. These roots take food from the soil.

The leaves are pale green. They are small. The edges of the leaf are like the teeth of a saw.

A balsam plant has many flowers. Some balsam plants have red flowers. Others have white or pink flowers.

The flower is fairly large. It has a deep cup with a pointed tip. The flower usually grows into a small fruit. As it grows older, this turns yellow. If you touch it, it explodes and the seeds are thrown off.

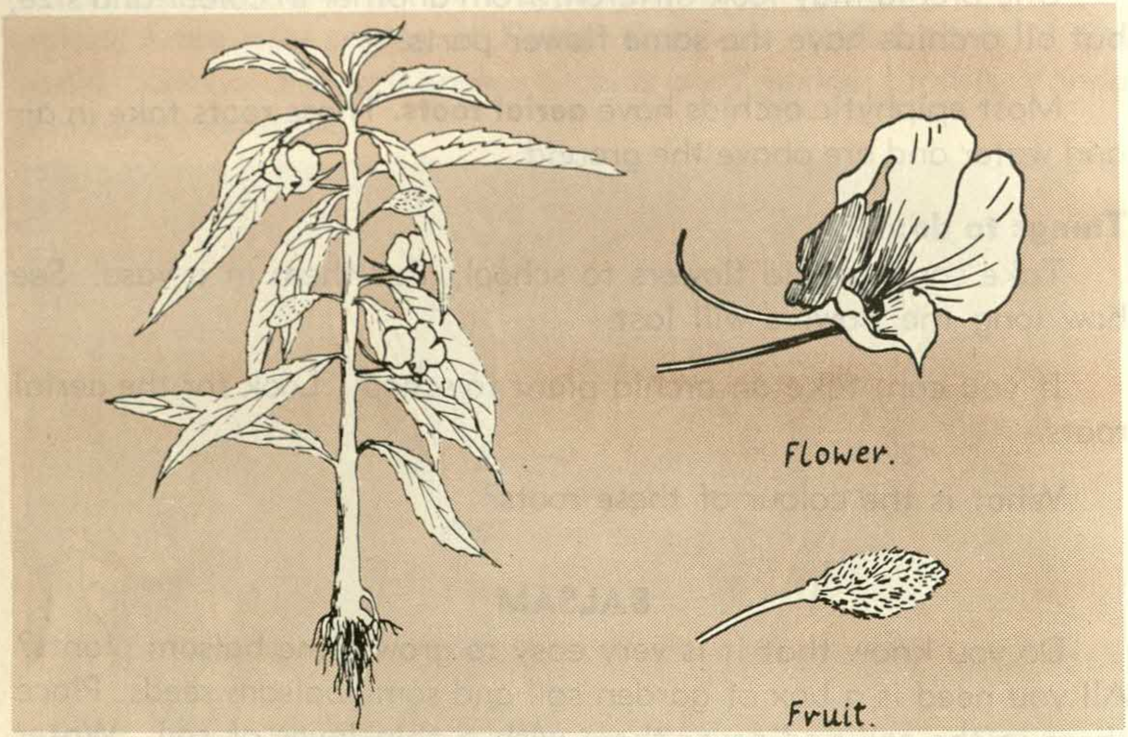


Fig. 30

Things to do:

1. Grow some balsam plants from seeds in a box of soil or in the garden. Water the plants every day.
2. If you have balsam plants growing in the garden, take one of them to school.

Draw the flower, the leaf, and the fruit.

A FLOWERING PLANT THAT CLIMBS

The Morning Glory has long thin stems. The stem coils round supports so that the leaves can receive sunlight. A plant that needs support for the stem, is called a weak-stemmed plant. Thus the Morning Glory is a weak-stemmed plant.

The flower of the Morning Glory is purple.

If you tear open the flower you can see many stalks. Some are long and others are short. These are called **stamens.** The stamens have white grains on top which are their **pollen.** The fruit grows into a small round fruit.

In the morning the flower of the Morning Glory opens. In the afternoon the flower closes and fades.

The leaf is shaped like the fingers of your hand.

Things to do:

Get a Morning Glory leaf. Place it under a white sheet of paper. Go over it with a green colour pencil. Cut out the leaf rubbing and paste it in a book.

Things to do:

Get a Morning Glory flower. Make a drawing of it.

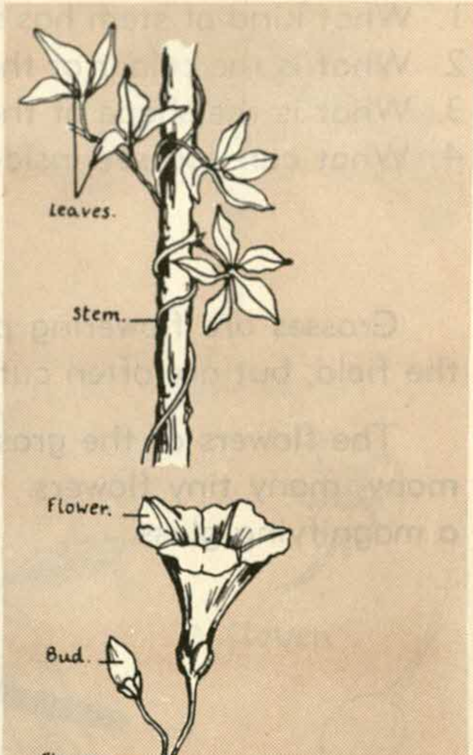


Fig. 31

Cut the flower in half, and make a drawing of the half flower. Name the stamens, the pollen grains and the petal. Is the flower scented?

EXERCISE Answer these questions:

1. What kind of stem has the Morning Glory plant? ....
2. What is the colour of the Morning Glory flower? ....
3. What is the shape of the Morning Glory flower? ....
4. What can you see inside the Morning Glory flower? ....

GRASSES

Grasses are flowering plants. These grow in the garden or in the field, but are often cut so that you do not see the flowers.

The flowers of the grass are small. A single flower stalks has many, many tiny flowers. You can see these flowers clearly with a magnifying glass.

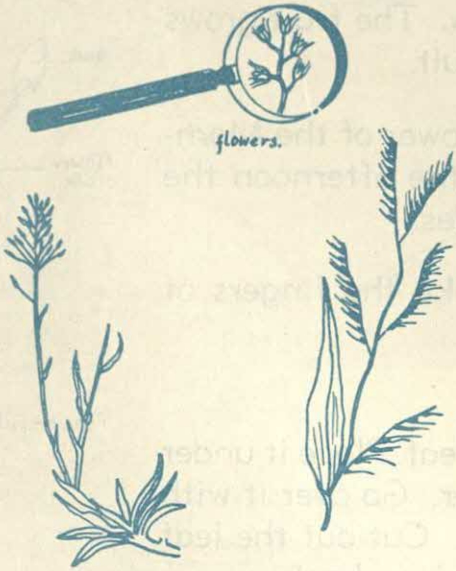


Fig. 32

Things to do:

Look for grasses that bear flowers. Are there many flowers? ......

....

What is the colour of the flower? ....

What do the leaves of grass look like? ....

THE KASHMIR CHERRY TREE

The Kashmir cherry tree is a small and shady tree. Children like to climb the tree and pluck the cherries to eat. Birds and some insects like to eat the fruits. The picture on the right shows us the shape of the tree. The main trunk rises up to 3 to 4 meters. It then divides into many small branches.

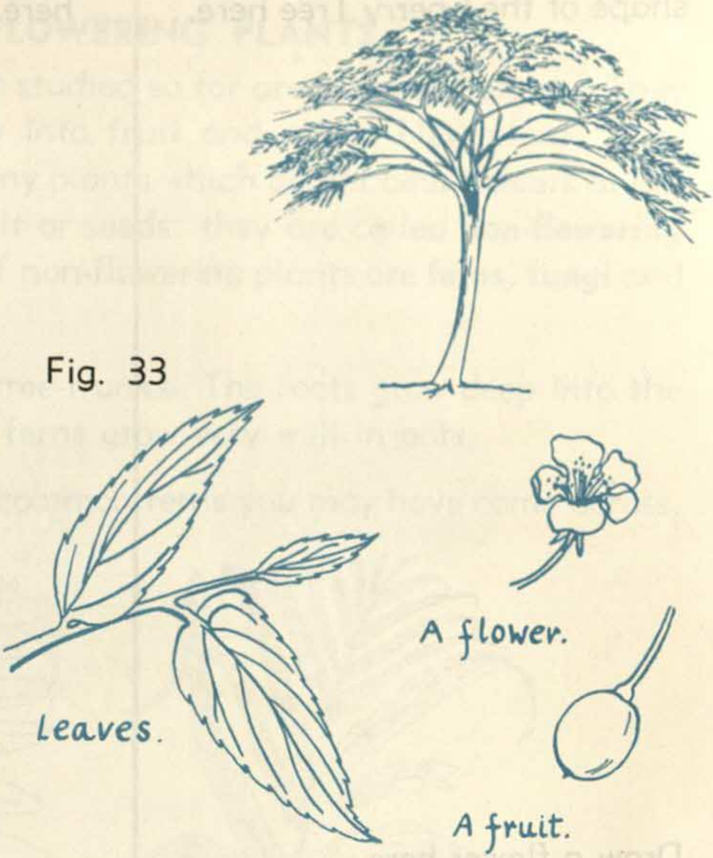


Fig. 33
Leaves.
A flower.
A fruit.

If you rub the trunk with your hand, you will find that it is rough because of the many knots here and there. The bark of the young branches is smooth and greenish in colour.

The leaves are small. The surfaces are covered with very fine hairs, so that if you touch a leaf, you can feel the stickiness. The edges of a leaf are like the teeth of a saw.

The flower of the cherry tree is small and white in colour. It has **five** white petals. In the centre are a large number of stalks. Bees and other insects like to visit the flowers to suck the juice.

The cherry that appears after the flowers drop is small and green. It grows bigger and bigger until it becomes orange or red. It is a juicy fruit. Inside it are many seeds.

Make a drawing to show the shape of the Cherry Tree here.

Make leaf and bark rubbings here.

Draw a flower here.

Keep the flowers and leaves under a pile of newspapers, until they are dry. Paste them in your book.

CHAPTER 6

NON-FLOWERING PLANTS

All the plants we have studied so far are flowering plants. They have flowers which grow into fruit and seeds. New plants grow from seeds. There are many plants which do not bear flowers at all. These plants have no fruit or seeds: they are called **non-flowering plants.** Some examples of non-flowering plants are **ferns, fungi** and **bacteria.**

Some ferns grow on tree-trunks. The roots grow deep into the trunk for support. Some ferns grow very well in pots.

Shown here are some common ferns you may have come across.

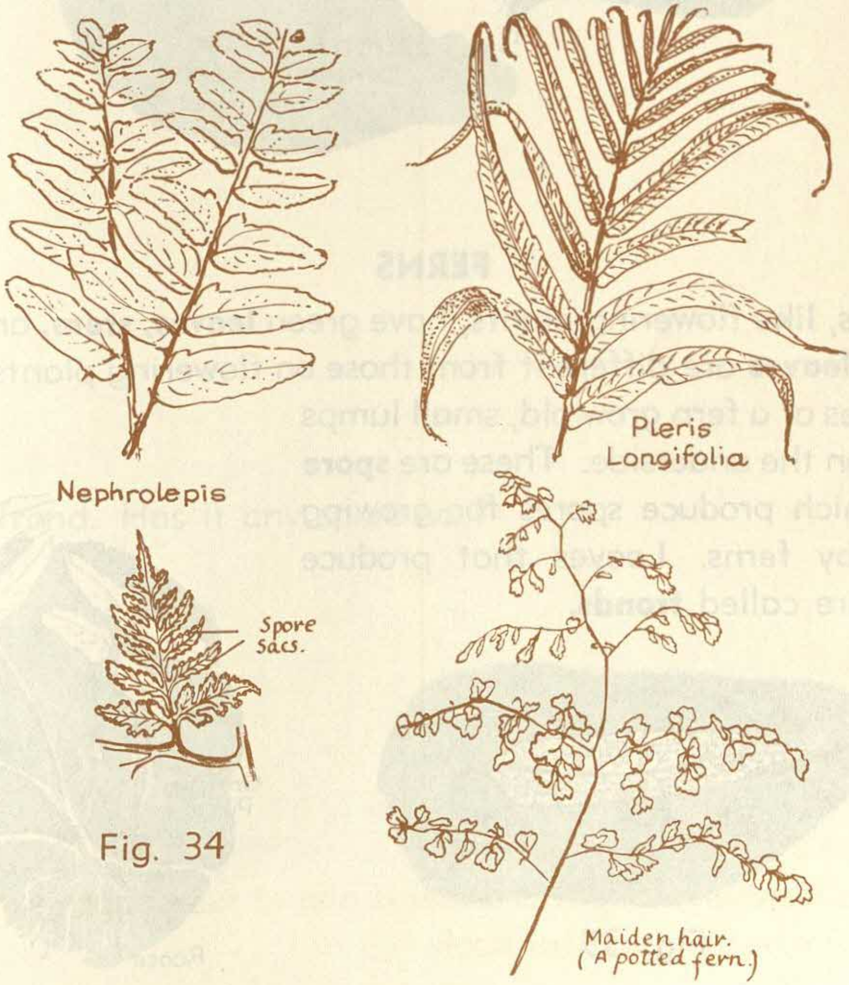

Nephrolepis
Pleris Longifolia
Spore Sacs.
Maiden hair.
(A potted fern.)

Fig. 34

Bird's Nest fern.
(Common on tree trunks.)

FERNS

Ferns, like flowering plants, have green **leaves, stem,** and **roots,** but the **leaves** are different from those on flowering plants. When the leaves of a fern grow old, small lumps appear on the underside. These are **spore sacs,** which produce spores for growing into baby ferns. Leaves that produce spores are called **fronds.**

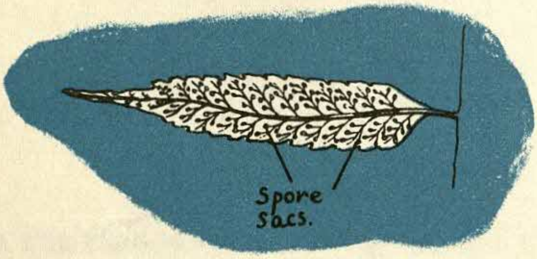
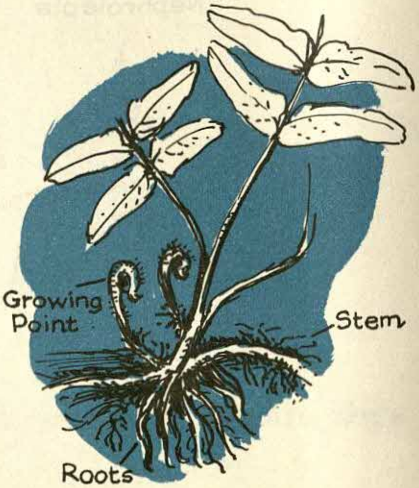


Fig. 35



A practical study of a common fern.

Things to get: A fern

1. Has the fern leaves? ....
2. Are the leaves big or small? ....
3. What is the colour of the fern's top surface? ....
4. What is the colour of its under surface? ....
5. Are there any round things underneath the leaves? ....
6. If there are, what are they? ....
7. Has the plant any root? ....
8. Are the roots big or small? ....
9. Are there hairs on the roots? ....

Draw diagrams of a fern plant here.

Draw a frond. Has it any spore sac?

EXERCISE Fill in the blanks:

1. Ferns have stems, roots and ....
2. The leaves of ferns are called ....
3. On the underside of fronds are ....
4. Write the names of three plants that have no flowers
   (a) .... (b) .... (c) ....

Mushroom and Toadstool

The mushroom and the toadstool are non-flowering plants, but they are different from ferns. **They have no green parts. Therefore they cannot make food from sunlight.** They live on decaying food, such as rotten leaves and plants.

There are many kinds of mushrooms; some grow in places where there is animal **manure** such as cow-dung.

Some mushrooms are **edible** but many of them are **poisonous.**

Mushrooms and toadstools are also found growing on dead tree-trunks or on the trunks of living trees. These get food from the trees.

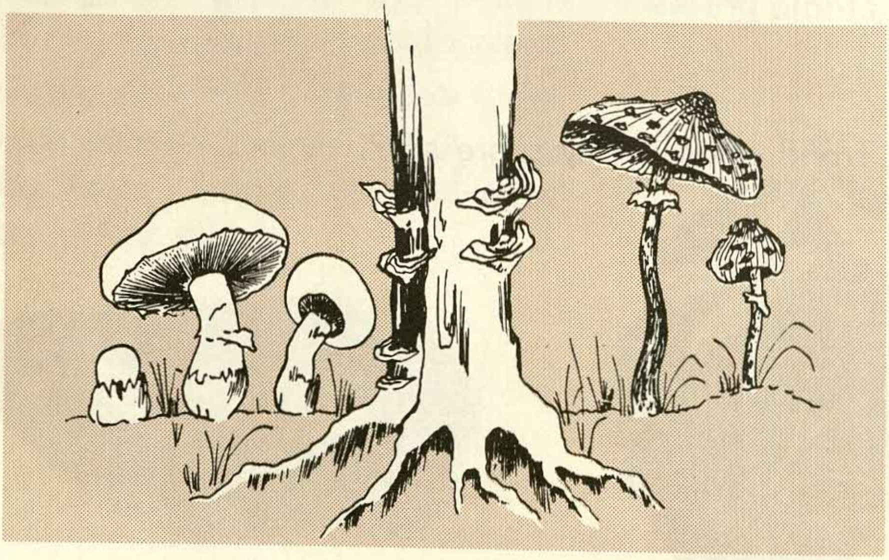


Fig. 36

If you examine a mushroom you will find that it has a large cup. Underneath are a number of blade-like parts. These are called **gills.** The gills produce **spores.**

The umbrella-shaped cap is held up by a round stalk. The stalk has a large number of thin white threads. These are like the roots of a plant. They hold the mushroom in the ground. They also take food from the soil.

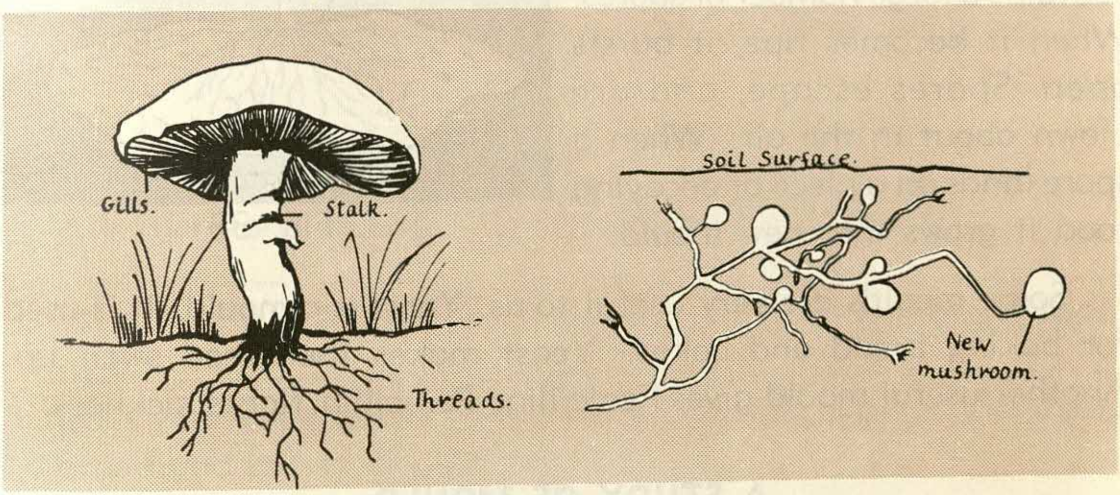


Fig. 37

Remember that the whole plant is white and has no green parts at all.

When the gills are ripe, the brown spores fall to the ground. Sometimes the spores are carried by the wind. When a spore falls on ground which is damp and warm it grows many 'threads.' Then a small round shoot is seen. This pushes to the surface of the ground to become another mushroom.

EXERCISE Fill in the blanks:

1. A mushroom is different from a fern because it has no ....
2. Name two places where mushrooms grow.
   (a) .... (b) ....

MOULDS

These are non-flowering plants. They are very small plants. They have no green leaves and cannot make food from sunlight. They take food from decaying foods such as stale bread or jam that has been left in the open.

Each mould has a small head, a stalk and many fine threads. The threads take in food. The head contains a large number of spores. When it becomes ripe, it bursts open. Spores escape, and are blown about in the air. When a spore lands on a piece of decaying food it grows into new mould.

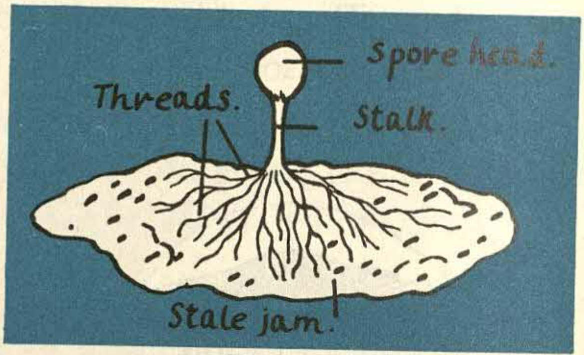


Fig. 38

Some moulds are very useful to us. Yeast is a mould. It is used for baking bread and cakes. Yeast makes the bread swell up. Another useful mould gives Penicillin. Penicillin fights sickness.

A STUDY OF MOULD

Things you need:

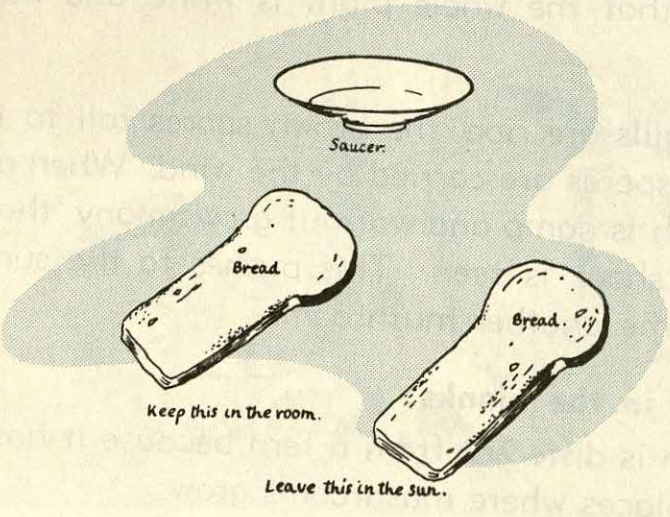

Saucer.
Bread
Bread.
Keep this in the room.
Leave this in the sun.

Fig. 39

Things to do:

1. Place each slice of bread in each plate or saucer.
2. Leave one in the nature corner and the other in the sun for two or three days.
3. Look at the slices of bread.

Results:

1. Are the slices of bread damp?

   ....

2. Has the bread left in the sun become dry after three days?

   ....

3. Are there any moulds growing on the dry bread?

   ....

4. Are there any moulds growing on the damp bread?

   ....

5. What is the colour of the moulds growing on the damp bread?

   ....

6. Does your experiment show that moulds can only grow in damp bread and not in dry bread?

   ....

Things to do:

1. Place some green peas in a bottle. Sprinkle water on the peas. Keep the bottle in the dark for a few days.

   Can you see any moulds growing on the peas?

EXERCISE

Fill in the blanks:

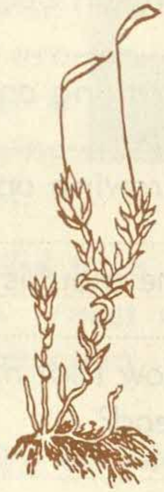
1. Moulds cannot make food from sunlight because they have no ....
2. The 'head' of a mould contains ....
3. The spores of a mould are carried from place to place by ....
4. .... is a very useful mould.

MOSSES

Mosses are another group of non-flowering plants.

Mosses are very small plants. They have green leaves and stem. They grow in places where there is sunlight and water, such as on a wall or on rocks.

Mosses have green leaves. Therefore they can make food from sunlight.



A moss.

Fig. 40

ALGAE

Algae, and bacteria or 'germs', are even smaller plants than moulds.

There are different kinds of algae. There are brown algae green algae, orange algae and red algae. These algae sometimes grow together. (The green scum seen in a fish tank or aquarium or on damp walls consists of green algae).

All algae need sunlight to make food. For this reason algae only grow in places where they can get sunlight.

The green scum in the fish tank or aquarium, or on damp walls and floors, can grow because there is sunlight shining on it.

Other kinds of algae grow on rocks, damp tree-trunks and the trunks of growing trees. Seaweeds are also algae.

BACTERIA

Bacteria, which are often called 'germs', belong to another group of non-flowering plants. They are colourless and very small indeed. They do not come from seeds or spores. As a bacterium grows bigger it splits into two bacteria. As this goes on a single bacterium can reproduce a large number of bacteria, in a very short time.

There are many kinds of bacteria. Some have hairs and others do not. Some are joined and others are not. Those shown in fig 41 are enlarged many, many times.

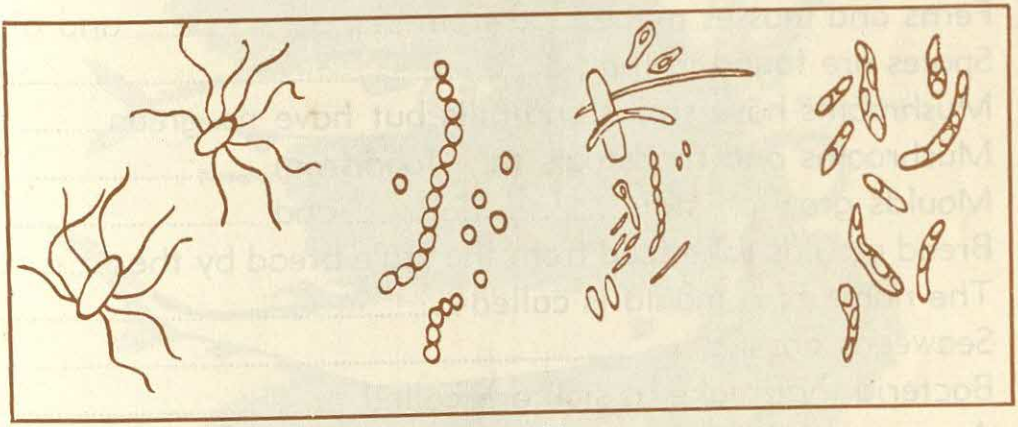


Fig. 41

Kinds of bacteria.

Those kinds of bacteria that live in the soil are very useful. They help to make food for plants.

The kind of bacteria called 'germs' is bad. It makes food bad and causes sickness. These bacteria get into a person's body through the nose, the throat, the mouth and any wound. Some sicknesses caused by bacteria are typhoid and tuberculosis.

So you see there are many plants in the world that have no flowers. Many of these are small. Many of them are very useful.

Non-flowering plants can be grouped into the following:

1. Ferns
2. Mosses
3. Mushrooms
4. Moulds
5. Algae
6. Bacteria

A test

1. A fern plant has fronds, ..., and .... but it has no ....
2. A fern plant grows from a ....
3. Spores are found on the underside of the old ....
4. Ferns and mosses make food from .... and air.
5. Spores are found in the ....
6. Mushrooms have stalks and gills but have no green ....
7. Mushrooms and toadstools take food from ....
8. Moulds grow on stale .... and ....
9. Bread moulds take food from the stale bread by the ....
10. The name of a mould is called ....
11. Seaweeds are ....
12. Bacteria that make us sick are called ....
13. A very useful mould used for making medicine is called the ....

CHAPTER 7

SOME COMMON SEAFISH

Shown here are some common fish which can be bought from the market.

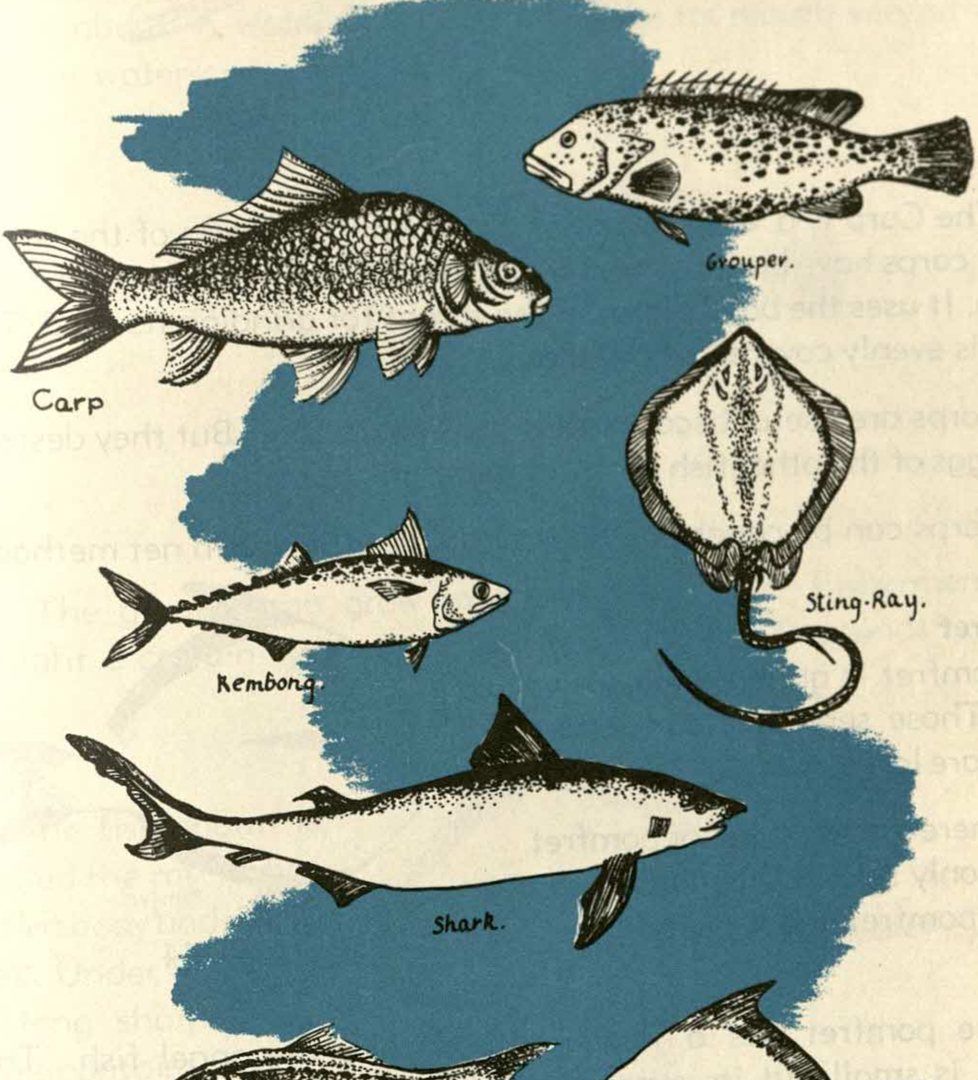


Fig. 42

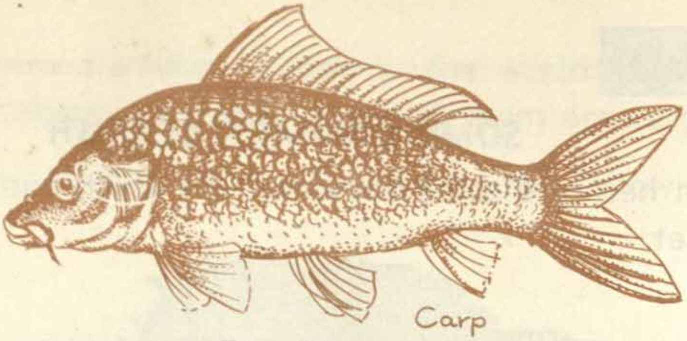


Fig. 43

Carp

The Carp is a very common fish found in all parts of the world. Most carps have barbales which look like whiskers. The carp has no teeth. It uses the bony plates in the throat for grinding its food. The carp is evenly covered with scales.

Carps are useful because they are used as food. But they destroy the eggs of the other fish and are, therefore, harmful.

Carps can be caught by hook and line or by drawn net methods.

Pomfret

Pomfret is quite an expensive fish. Those served in our restaurants are large ones.

There are two types of pomfret commonly sold in the market, the white pomfret and the black one.

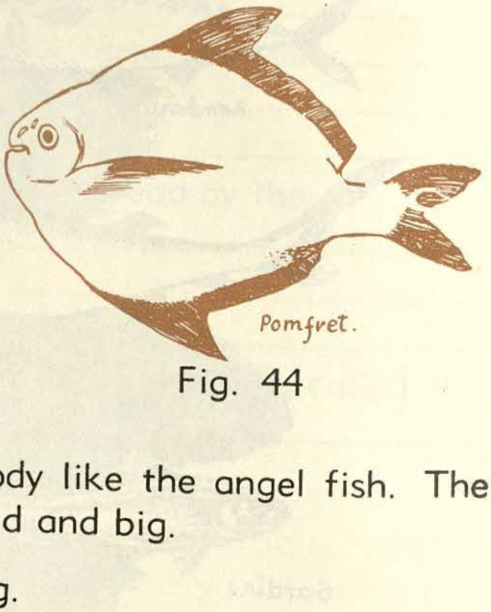


Fig. 44

The pomfret has a flattened body like the angel fish. The mouth is small but its eyes are round and big.

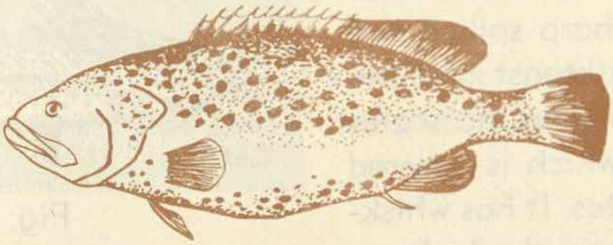
The upper and lower fins are long.

Grouper

The grouper is another expensive fish. People like to steam this fish for the table.

There are many types of grouper. The commonest one is the brown grouper with black spots. The others are black.

The grouper has a very wide mouth and a big head. The scales are very fine, and the gill covers are large and thick. When it swims about in water it opens and closes its mouth very often to take in water containing air.



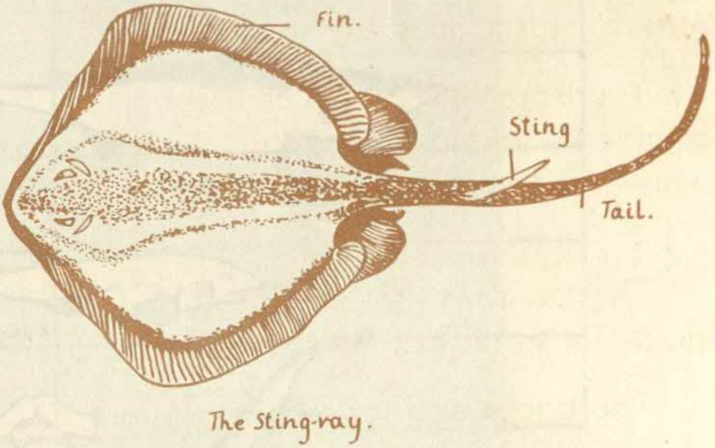
A Grouper.

Fig. 45

The grouper can grow to a very large size. Fishermen have caught a certain type of grouper weighing 1,000 pounds!

Ray

The fish shown is called the ray. It has a flat body and a long tail. Under the tail is a long sharp **sting.** This contains poison. When it is disturbed or frightened by an enemy it swings around its body, using its sting to defend itself. The two sides of the body are thin. These are the fins.



The Sting-ray.

Fig. 46

On the upper surface are two bulging eyes. If the ray is turned over you can see the wide mouth, and a row of slits. These are the gills. The gills open and close all the time, taking in water containing air.

The ray eats a group of sea animals called molluscs. These are shellfish.

Catfish

Catfish is a fresh water fish. It has sharp spikes and spines on the breast and the back fin. There are no scales on the body which is covered with bony plates. It has whiskers round the mouth which are used as sensitive feelers.

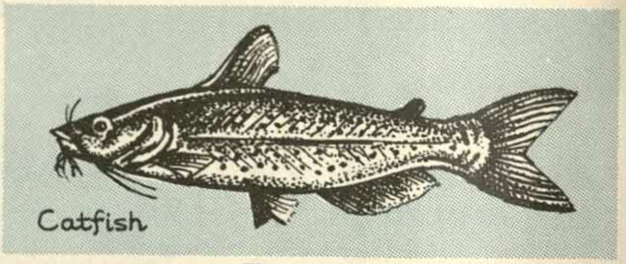


Fig. 47

The catfish makes its nest in a sheltered place. They are good to eat.

Sharks

There are many kinds of sharks as you can see here.

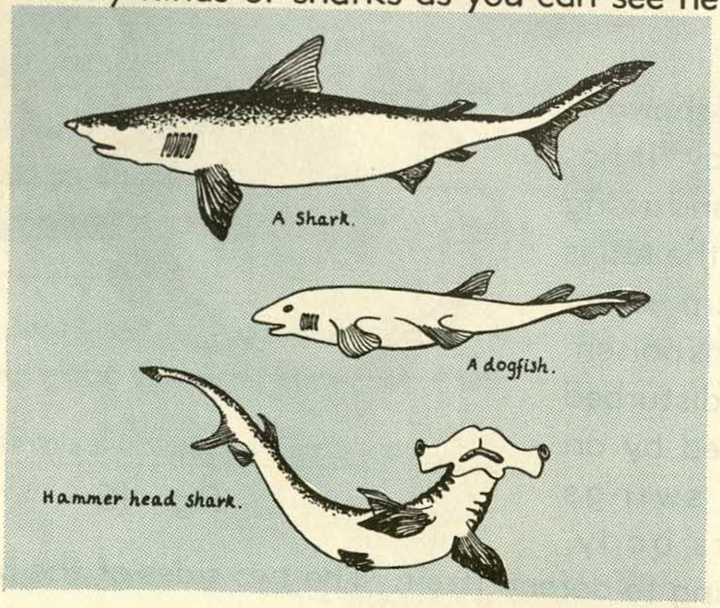

A Shark.
A dogfish.
Hammer head Shark.

Fig. 48

These are big and powerful. Sharks are deep-sea animals. There are many stories about sharks. They all tell us that sharks are dangerous fish. A shark is a dangerous animal, especially if it is disturbed or annoyed. It has a powerful tail and fins. Its mouth is big and wide and is under its head. The skin is rough and feels like sandpaper.

The only edible shark is the dogfish.

Things to do:

1. The next time you go to the market find out the following: the price of the various kinds of fish and write your answers here.

Kinds of fish	Price per kilo

2. How are these caught?

CHAPTER 8

ANIMALS AND PLANTS OF THE SEASHORE

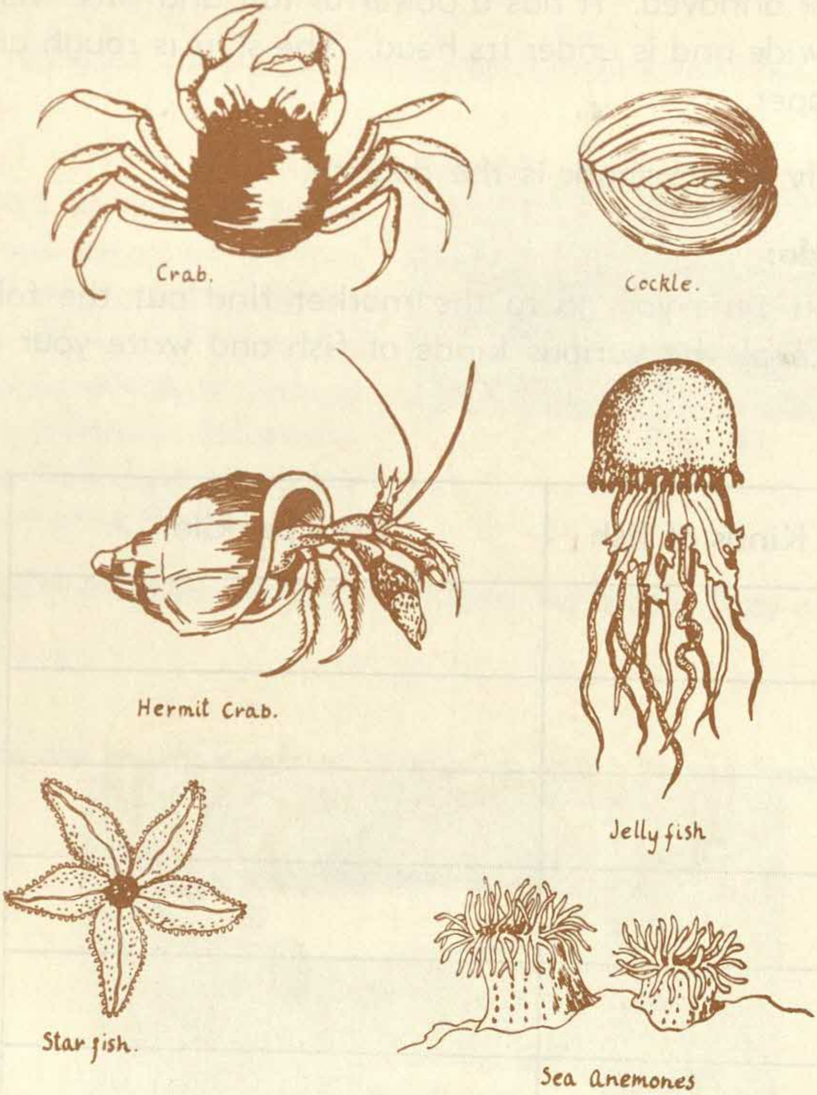


Fig. 49

If you take a walk along the beach you will certainly come across some of these animals. Some live in the sea and come up to the shore for food. Others live on the shore where the tide comes and goes.

If you go for a swim, look for these animals. Take them to school.

The Edible Crab

The edible crab lives in shallow water among the rocks. Its body is covered with a hard shell. This protects it from harm. The legs, which are also covered with shell, are 10 in number. The two front ones are large and have pincer-like **claws.** Four pairs of legs have pointed tips. A crab uses these for digging into sand and mud. It also uses them for walking on rocks and the sea floor. The last pair of legs are flapper-like. These are for swimming.

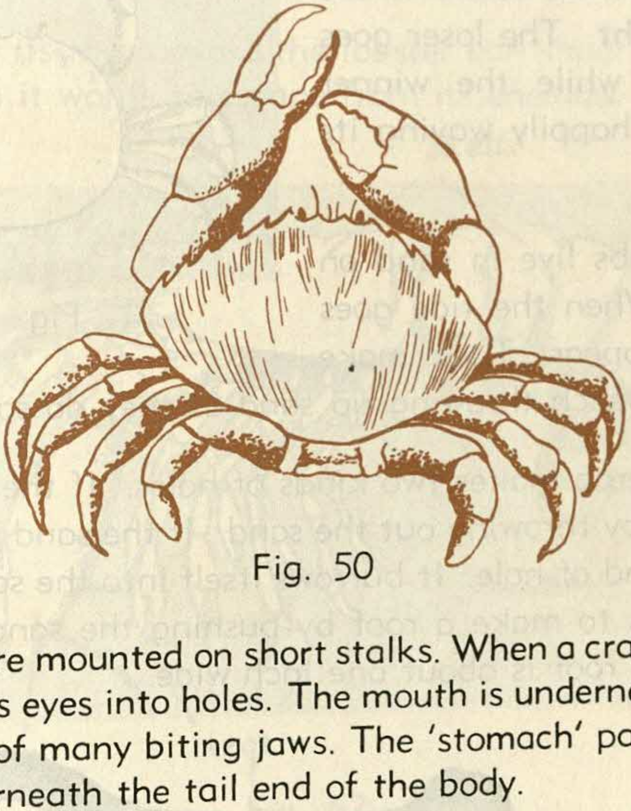


Fig. 50

The eyes are mounted on short stalks. When a crab is disturbed, it withdraws its eyes into holes. The mouth is underneath the body. It is made up of many biting jaws. The 'stomach' part of the crab is folded underneath the tail end of the body.

The crab lives on dead sea animals and other sea food that it finds among the rocks.

If you leave a crab on the floor it moves away very quickly to hide under cover in holes or corners. Unlike a man a crab moves sideways.

Things to do:

Bring a crab to school.

1. How many pairs of legs has it got? ....
2. How many pairs of legs have pointed tips? ....
3. How is the crab protected? ....
4. Leave it on the floor and see how it crawls away.

The Soldier Crab

This crab gets its name because of its love of fighting. Whenever two male soldier crabs meet, they fight. The loser goes away quietly while the winner dances about happily waving its two long legs.

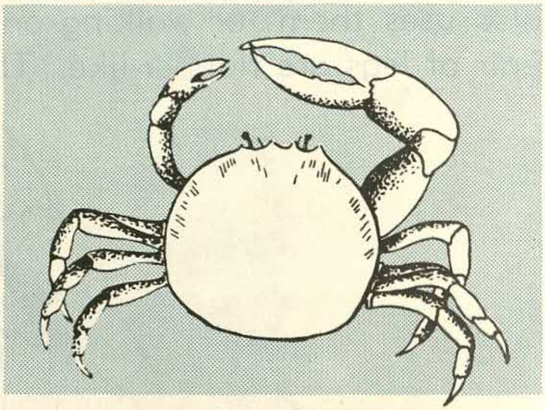
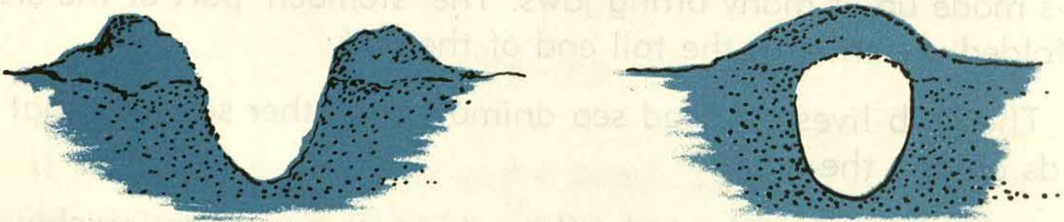


Fig. 51A

Soldier crabs live in sand on the beach. When the tide goes down they appear. They make holes on the beach throwing up sand as they do so.

A soldier crab makes two kinds of holes. If the sand is dry, it makes a hole by throwing out the sand. If the sand is wet it makes a different kind of hole. It burrows itself into the sand. Inside the sand it begins to make a roof by pushing the sand upwards and sideways. The roof is about one inch wide.



Hole in dry sand.

Hole in wet sand.

Fig. 51B Holes on the beach made by soldier crabs.

The Lobster

The soft body of a lobster is covered with crusty shell. The shell that covers the head is big. Jutting out to the front is a spine. Its eyes are at the end of two short stalks. Coming out from the head are two long **feelers.**

A lobster walks on the sea floor with its **legs.** There are four pairs. It has a pair of very powerful pincers. These are so strong that the lobster uses them to crack open shell animals.

A lobster has a number of hair-like things on its body. These are the **swimmerets.** It uses them to move about in the sea.

By bending its tail forward the lobster can shoot backward. It does this when it wants to escape from its enemies.

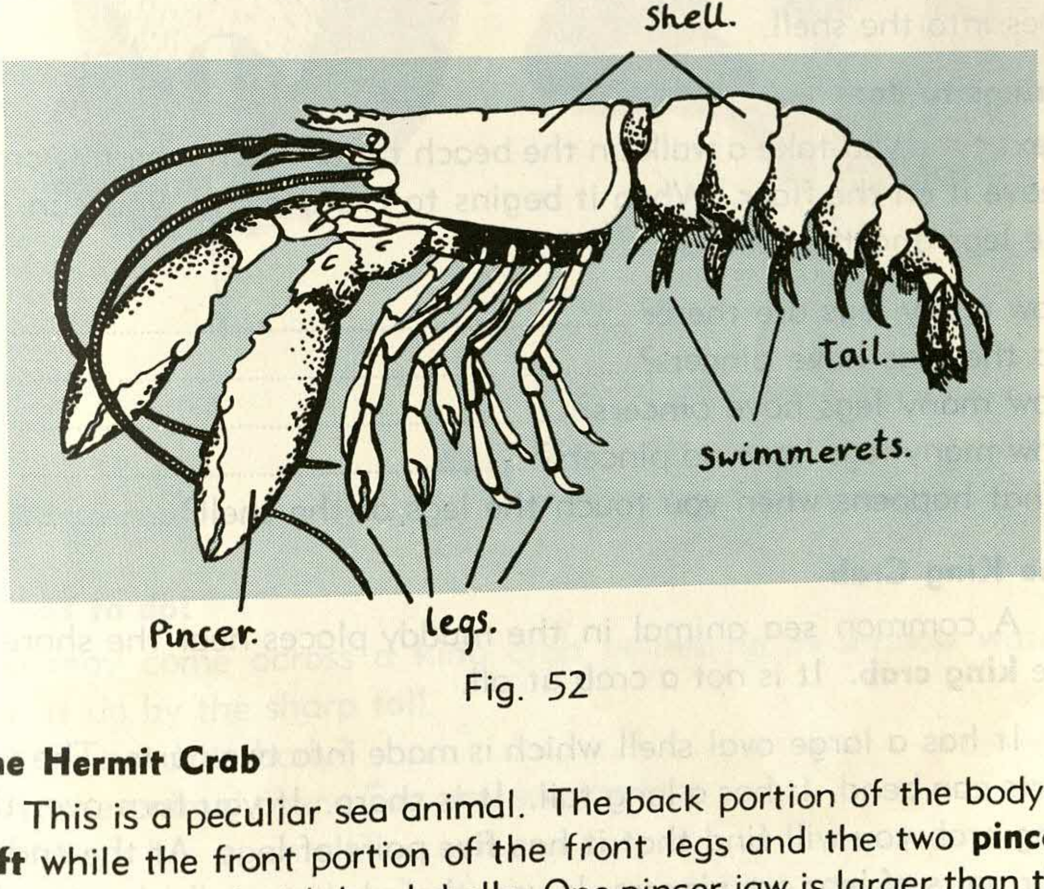


Fig. 52

The Hermit Crab

This is a peculiar sea animal. The back portion of the body is **soft** while the front portion of the front legs and the two **pincer-jaws** are covered with hard shells. One pincer-jaw is larger than the other.

The hermit crab has no home of its own. When it hatches from an egg it immediately looks for the empty shell of another shellfish, e.g. the whelk, to hide its soft body. The soft portion of the body attaches itself to the shell while the shell covered portions can move in and out of the shell. In this way, the soft body is well protected and the entrance to the shell is well guarded.

The hermit crab crawls about slowly on the beach using its walking legs.

When it grows bigger it will look for another shell. It looks for a bigger shell because its body has grown too big for the one it has.

When the hermit crab is disturbed or frightened, its entire body goes into the shell.

Things to do:

Next time you take a walk on the beach try to catch a hermit crab. Leave it on the floor. When it begins to crawl along, you can see the legs and the feelers.

How many legs are there? ______________________________
Do the legs have pincers? ______________________________
How many legs have pincers? ____________________________
How many legs have no pincers? __________________________
What happens when you touch the legs or the shell? __________

The King Crab

A common sea animal in the muddy places near the shore is the **king crab.** It is not a crab at all.

It has a large oval shell which is made into two parts. The two parts can bend. It has a long tail. It is sharp. If you turn over the king crab you will find that it has **five** pairs of legs. At the end of four pairs of legs are **pincers.** It uses these legs to walk about under the sea and also to push food into its mouth.

Very often you find a king crab on its 'back'. It has a very easy way to turn itself back again. It digs its long tail into the sand and then twists its body. In this way the king crab turns over.

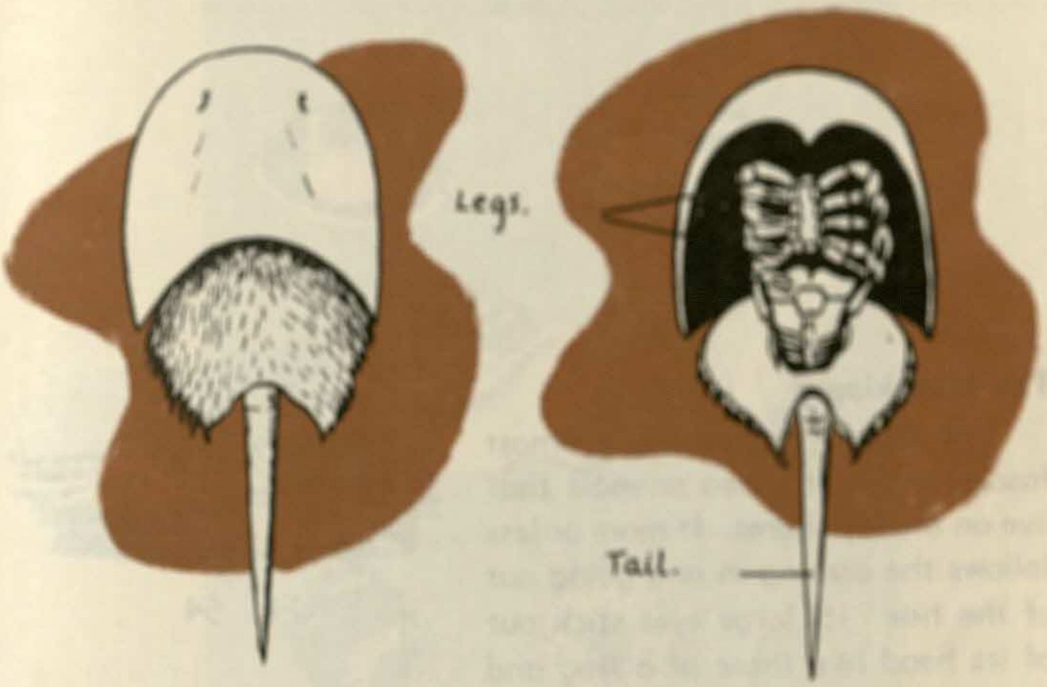


Fig. 53

Things to do:

You may come across a king crab swimming in shallow water. Pick it up by the sharp tail.

Does it bend its body? ....

Turn the animal over. Can you see the legs ....

Are these big or small? ....

How many legs are there? ....

Do the legs have pincers? ....

Draw a diagram of a king crab lying on its back. Name the legs, the shell and the tail.

The Mudskipper

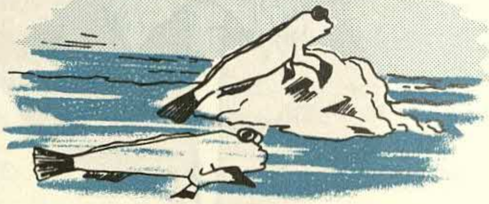


Fig. 54

The mudskipper is one of the most fascinating of the sea animals that live on muddy shores. It more or less follows the coming in and going out of the tide. Its large eyes stick out of its head like those of a frog and are very close together. These enable it to see things around it.

Mudskippers breathe through gills, but they can stay out of the water for some time by storing water in their gills. They skip and jump with great ease. They live on insects and small crabs which they catch among mangrove trees.

Mudskippers are good swimmers, as they have strong fins on the sides. These fins also help them to skip and to rest on the roots of mangrove trees or on rocks.

Things to do:

Next time you go to the beach look for mudskippers. See how they skip over the surface of the muddy shore.

THE SHELLFISH

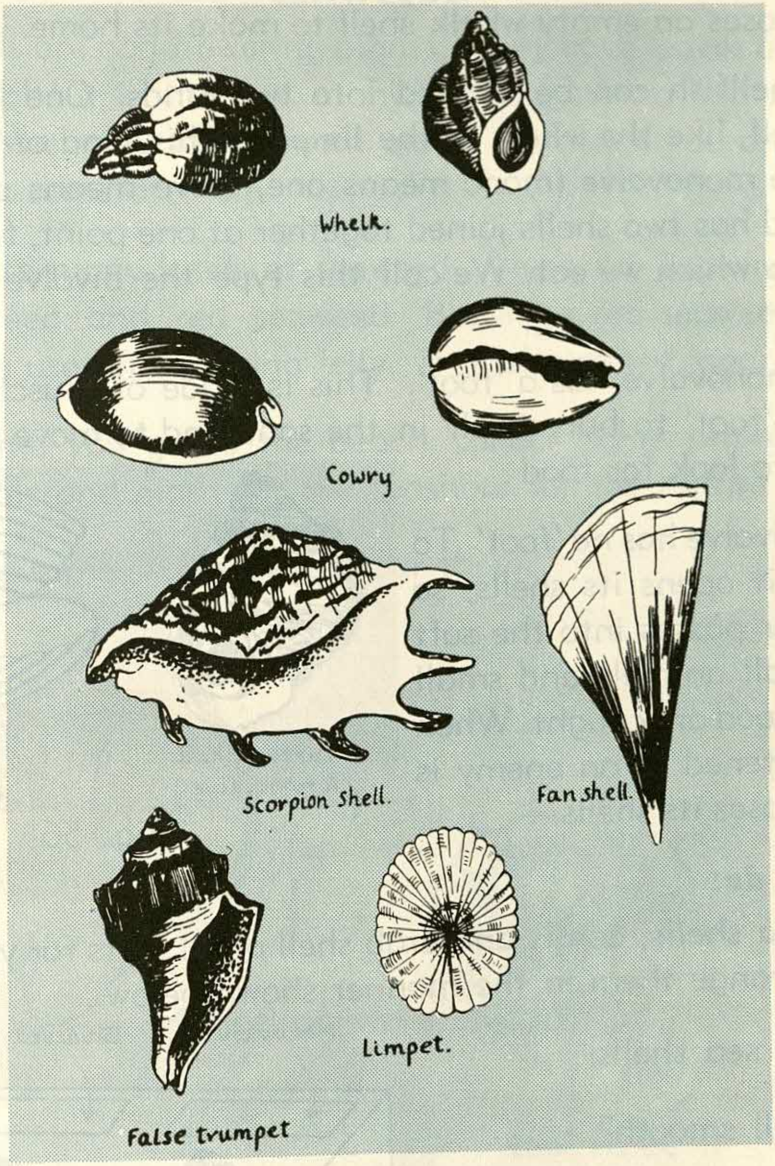


Fig. 55

All these sea shells are actually the skeletons of sea animals. These sea animals have soft bodies. They take chalk from the sea water and make it into a skeleton to protect their soft bodies. As they grow they add more chalk to it. We call these animals **shellfish** because they live in the sea. When the animal dies its soft body is eaten up by fish and the shell is washed about by the sea. Some of these empty shells are washed up on the shore. A hermit crab often chooses an empty whelk shell to make its home.

All shellfish can be divided into two kinds. One kind has a single shell, like the **whelk** or the **limpet.** This kind of shellfish is called the monovalve (mono means one, valve means shell). The other kind has two shells joined together at one point, for example the **cockle** which we eat. We call this type the bivalve (bi means two).

The monovalve has a 'foot'. This is made of muscles only. It uses this 'foot' to bury itself in the sand and to move from place to place to look for food

The bivalve has no 'foot' To get food it opens its shells, so that water passes into the soft body. Small animals and small pieces of food are caught. When it is frightened or an enemy is near, it closes its shells.

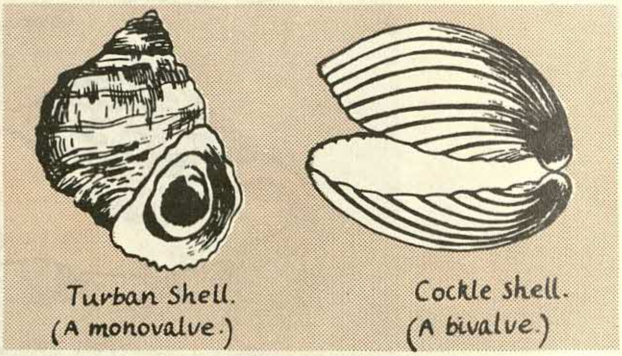

Turban Shell.
(A monovalve.)
Cockle Shell.
(A bivalve.)

Fig. 56

Things to do:

Collect sea shells, corals and crab shell of all sorts for your nature table. Arrange them in the manner shown below.

Study the sea shells.

Is the shell smooth?

....

Where did you find it?

....

Do we eat the flesh?

....

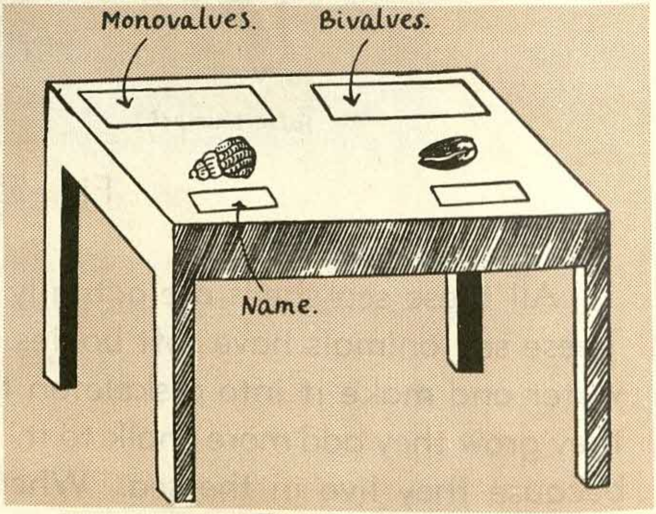


Fig. 57

SEAWEEDS

Seaweeds are non-flowering plants. They have leaves and roots. Some float about in the sea; many of these are washed up on the seashore. When you take a walk along the beach you are sure to come across some of them.

There are many kinds of seaweed. There are brown seaweed, green seaweed and red seaweed. Brown or red seaweed is very useful. It is used for making jelly. It is also called 'agar-agar'.

Next time you go to the beach collect some seaweeds and other animals and plants of the seashore for the nature corner.

Here are some seaweeds. Colour them.

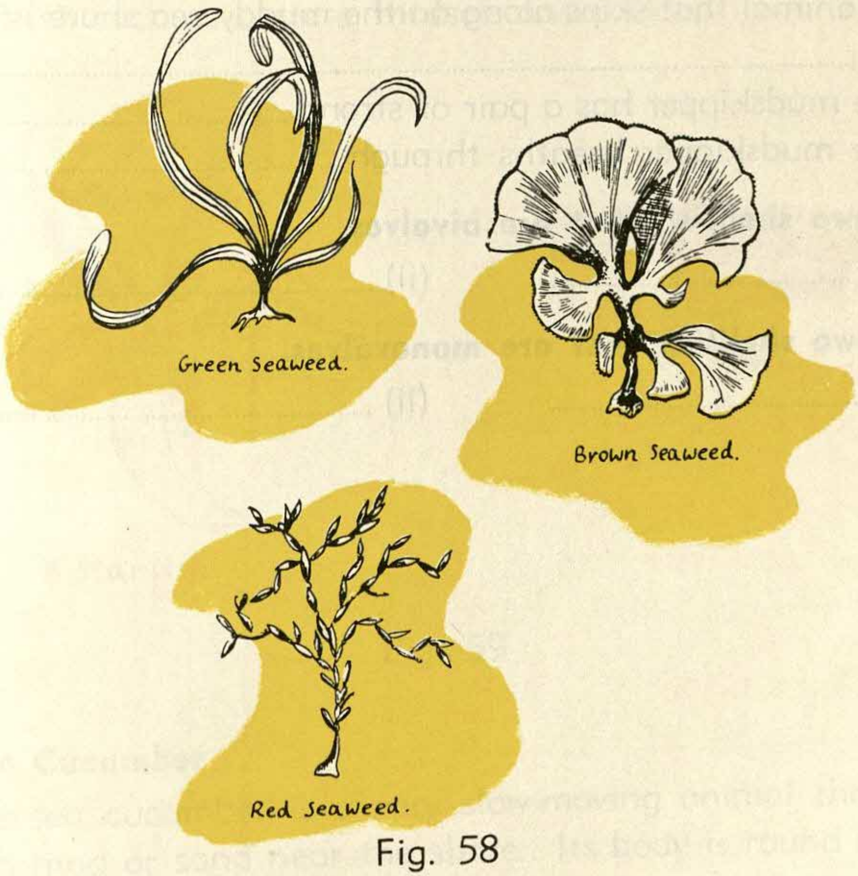

Green Seaweed.
Brown Seaweed.
Red Seaweed.

Fig. 58

A test

1. An edible crab has .... pairs of legs and .... pairs of pincers.
2. The eyes are mounted on ....
3. Folded under the body of a crab is the ....
4. A crab moves ....
5. Soldier crabs got their name because they love to ....
6. Soldier crabs live on the ....
7. The soft bodies of crabs and lobsters are protected by hard ....
8. The hermit crab lives in the shell of a ....
9. The body of a hermit crab is soft but its two .... are covered with shell
10. The king crab has a sharp strong ....
11. It has .... pairs of tiny legs.
12. An animal that skips along on the muddy sea shore is the ....
13. The mudskipper has a pair of strong ....
14. The mudskipper breaths through ....

Name two shellfish that are bivalves

(i) .... (ii) ....

Name two shellfish that are monovalves.

(i) .... (ii) ....

CHAPTER 9

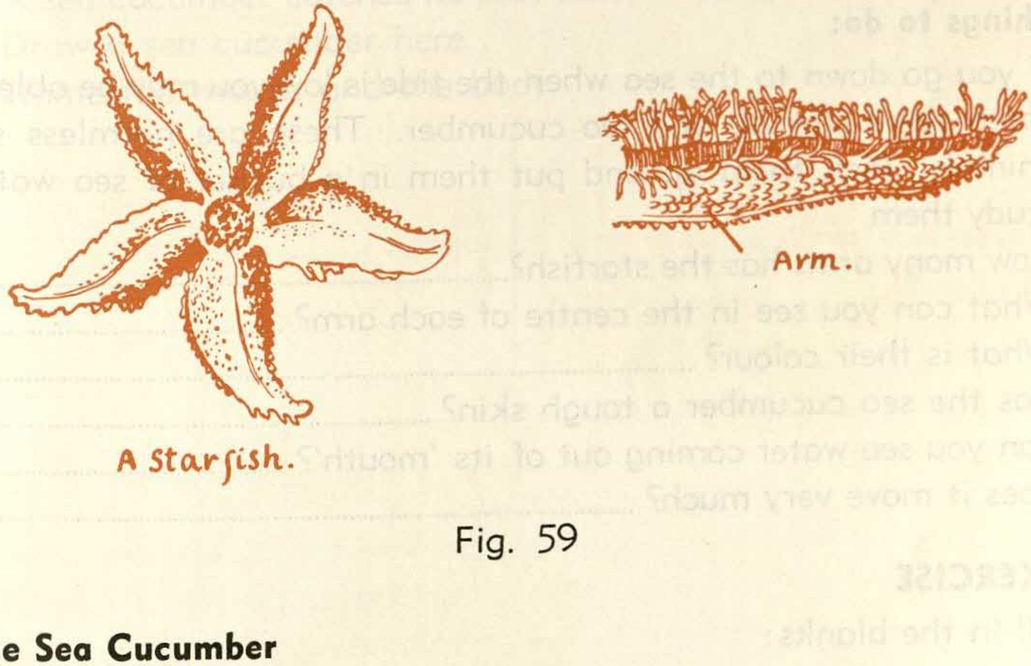
SOME INTERESTING SEA ANIMALS

Starfish

Those of you who go swimming from a rocky sea beach when the tide is low, may have come across many starfish.

The 'arms' of the starfish are like the points of a star. Some have only four arms but most of them have five arms.

The starfish has no head or eyes. It has a mouth in the centre where the arms meet. Along the arms is a large number of feelers called **tentacles.** Running through the centre of each arm is a tube. Water can enter and come out of these tubes. When water is withdrawn from the tubes, they become **suckers.** Using these suckers, a starfish can cling to rocks or shellfish. A starfish lives on shellfish such as oysters, mussels and cockles.



A Starfish.

Arm.

Fig. 59

The Sea Cucumber

The sea cucumber is a very slow-moving animal that buries itself in mud or sand near the shore. Its body is round and long like a cucumber. Its skin is rough, thick and tough. At one end of the body is the mouth. In some kinds of sea cucumber, the mouth is surrounded by a large number of tentacles. Tiny sea animals are caught on these tentacles. This kind of sea cucumber can catch its prey by another method. When it senses a crab or lobster nearby, it throws out a mass of white threads. The prey is then moved into its mouth. The threads are lost but more threads are grown inside its body. If you cut a sea cucumber in half, each half can grow into a new sea cucumber. This is also very common among sea animals such as starfish.

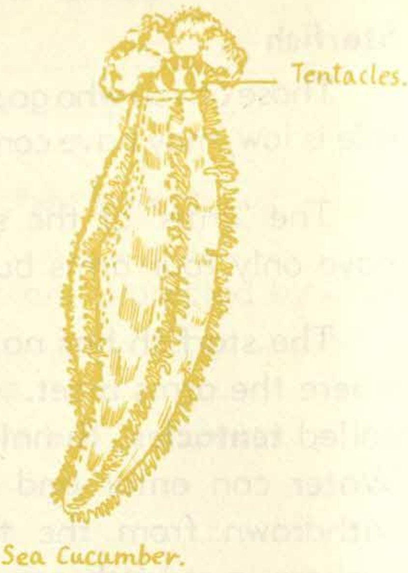


Fig. 60

Things to do:

If you go down to the sea when the tide is low you may be able to catch some starfish and sea cucumber. These are harmless sea animals. Pick them up and put them in a bucket of sea water. Study them.

How many arms has the starfish? ....

What can you see in the centre of each arm? ....

What is their colour? ....

Has the sea cucumber a tough skin? ....

Can you see water coming out of its 'mouth'? ....

Does it move very much? ....

EXERCISE

Fill in the blanks:

1. A starfish has .... arms.
2. On the arms are many ....

3. A starfish lives on .... such as .... and ....

4. Draw a starfish here.

EXERCISE

1. The body of a sea cucumber is .... and ....
2. A sea cucumber catches its prey .... out a mass of ....
3. Draw a sea cucumber here.
   Name the mouth and the body.

Leave this space for exercise on page 71.

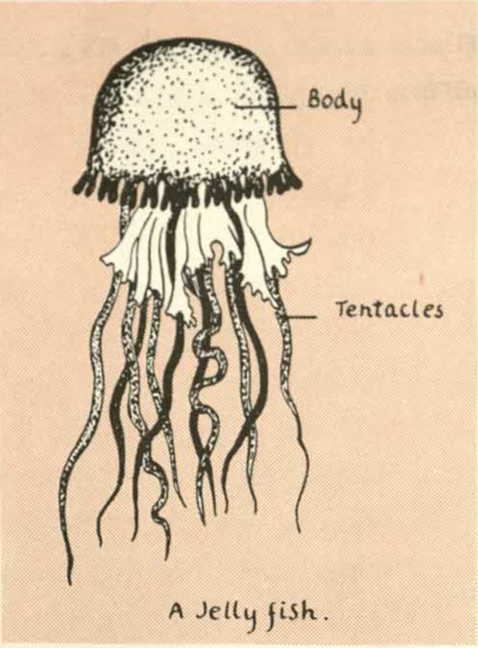


Fig. 61

Jellyfish

The jellyfish is not a fish at all, as it does not breathe through gills. It takes in air through its skin.

A jellyfish is made up of an umbrella-shaped body and a large number of feelers called tentacles. Around the edges of the 'umbrella' are fine hairs. The mouth is underneath the umbrella body, and is square in shape.

The jellyfish has no special parts to help it to swim. It moves about rather slowly on the surface of the sea by opening and closing its umbrella body. Waves and currents also help it to move.

The jellyfish catches its food with its tentacles. When a fish or other sea creature is caught by the tentacles, the body sends out a number of fine 'threads'. These threads contain poison which paralyse the creature. Then the tentacles slowly move the creature over to the mouth of the jellyfish so that it can swallow its catch.

There are many kinds of jellyfish. Some are beautifully coloured. Some are dangerous because of their poisonous threads. Do not handle a jellyfish when you see it drifting about in the water.

Things to do:

Many jellyfish have poisonous threads. Therefore do not touch a jellyfish with your hand. Catch it with a net and drop it from the net into a bucket of sea water.

What do you notice about the 'umbrella' body? ……………………………

……………………………………………………………………………………

What can you see underneath the 'umbrella' body? ……………………………

……………………………………………………………………………………

Touch the tentacles with a stick. Are there any threads coming out from the tentacles? ……………………………………………………………

……………………………………………………………………………………

EXERCISE

1. A jellyfish breathes through its ……………………………………………
2. The body of a jellyfish is shaped like ……………………………………
3. The mouth is underneath the ……………………………………………
4. The jellyfish swims about in the sea by …………………………………
5. It catches its food by ……………………………………………………
6. Draw a jellyfish on page 69. Name the body, the mouth and the tentacles.

The Seahorse

The seahorse is another fascinating sea animal. The body is made up mostly of bones. The head with a long 'snout' looks very much like the head of a horse — hence its name. The snout is actually a tube-like sucking mouth. When it sees a small sea creature it brings its snout very close to it. Then suddenly it sucks in the water and the creature with it.

The seahorse has a pair of small fins at the head part. These stick up like ears. Along the back of the body is a single fin. The seahorse drifts about feebly among seaweed using its tail to cling to the weed.

Bits of seaweed stick to its body, and thus form a sort of disguise. In this way it is protected from other sea creatures.

The male seahorse has a pouch in front of its body. The female lays her eggs in this pouch. After forty days, the eggs hatch into baby seahorses. These stay around the pouch with the father until they are big enough to look for food.

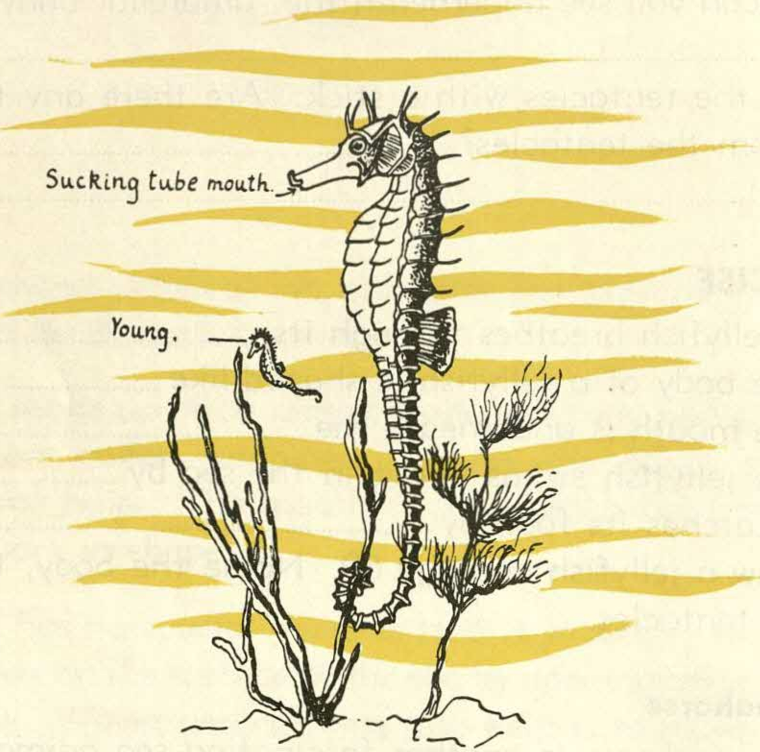


Fig. 62 Seahorse.

Seahorses are found on the Madras sea beach and are pretty to look at while swimming. The preserved head of a seahorse fitted on a wooden base is sometimes used as a chessman.

EXERCISE

Answer these questions:

1. What is the body of a seahorse made up of? ....

....

2. Which part of the body helps a seahorse to swim? ....

....

3. What does the seahorse eat? ....

....

Fill in the blanks:

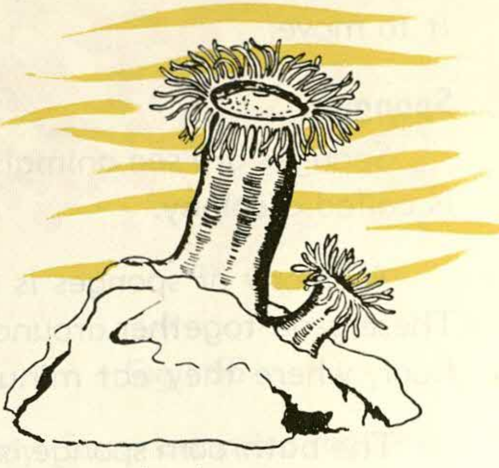
1. A seahorse lives among ....
2. It is the .... seahorse that takes care of the eggs and baby seahorses.
3. A seahorse clings to seaweed by its ....

The Sea Anemone

The sea anemone is one of the most colourful animals of the sea. Some are red, others are orange or purple.

The body of a sea anemone is soft and round. The lower part is flat; it uses this part to attach itself to rocks and the shells of other sea animals e.g. whelks or hermit crabs. The top part has a large number of soft tentacles. In the centre of these is a mouth.

Anemones do not move very much, but some are carried about on shellfish. By waving its tentacles the anemone makes a current of water which brings food to its mouth. Food taken in through the mouth goes straight to the stomach.



Sea Anemones

Fig. 63

The anemone, like the jellyfish, captures its food by its tentacles. It paralyses its prey by 'threads' which give out poison. It feeds on small plants and animals that drift about in water. There is one particular kind of fish which it does not try to harm. This is the **Clownfish,** which is often found swimming about among the anemone's tentacles without any harm coming to it.

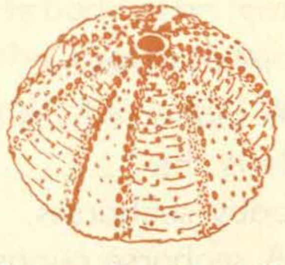
Sea Urchins

There are many types of sea urchins. Only one of them is drawn here.

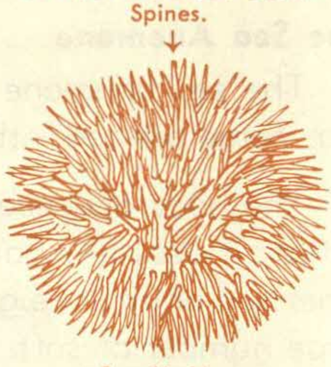
The sea urchin has a skeleton; this is made of lime which it gets from the sea. A sea urchin's skeleton may be very pretty.

Covering this skeleton are **spines.** These spines are sharp, and a sea urchin may use these to make a hole in the sea floor as its home.

At the lower part of its body is a tube-like 'foot'. The sea urchin moves from place to place on the sea floor by means of this 'foot'. The spines, too, help it to move.



Skeleton of a Sea Urchin



Sea Urchins.

Fig. 64

Sponges

Sponges are sea animals that live mostly in a group. This group is called a **colony.**

A colony of sponges is made of a number of jelly-like animals. These grow together around a skeleton and are attached to the sea floor, where they eat minute animals.

The bathroom sponge is made by collecting a colony of sponges. It is dried until the jelly mass around the skeleton has disappeared. What remains is a mass of skeleton.

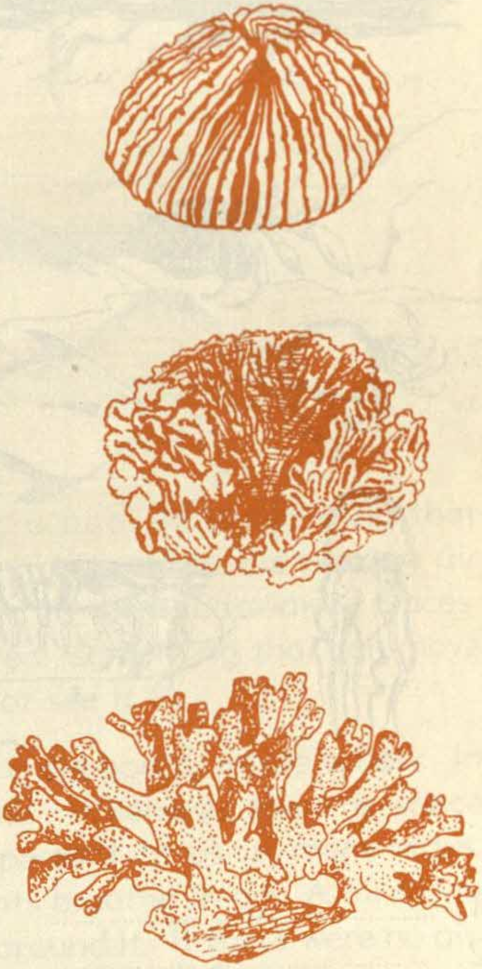
Things to do:

Try to get a bathroom sponge.
Is it soft? ....
Has it many holes? ....
Put it in water. Does it absorb water easily? ....
What is a sponge made of? ....

Corals

Corals come from the sea, and are actually the bones of coral animals. When these animals are born they float about in water until they float on to a rock. Then they begin to grow like plants. Little coral buds appear. In these buds are coral animals. In time a large number of corals begins to appear. When these coral animals die their bones are left behind. These are the corals.

In the sea, corals are of different colours. There are red, green, purple, blue and yellow corals. When a large number of corals group together, they look like a bed of flowers. Colourful water plants and seaweeds live among corals. Pretty fish swim among them.



Corals.

Fig. 65

Corals are arranged in a beautiful way. Some are piled together like a round ball. Some spread out and look like fans, and others have long horns.

EXERCISE

Can you recognise the sea animals here? Write their names below

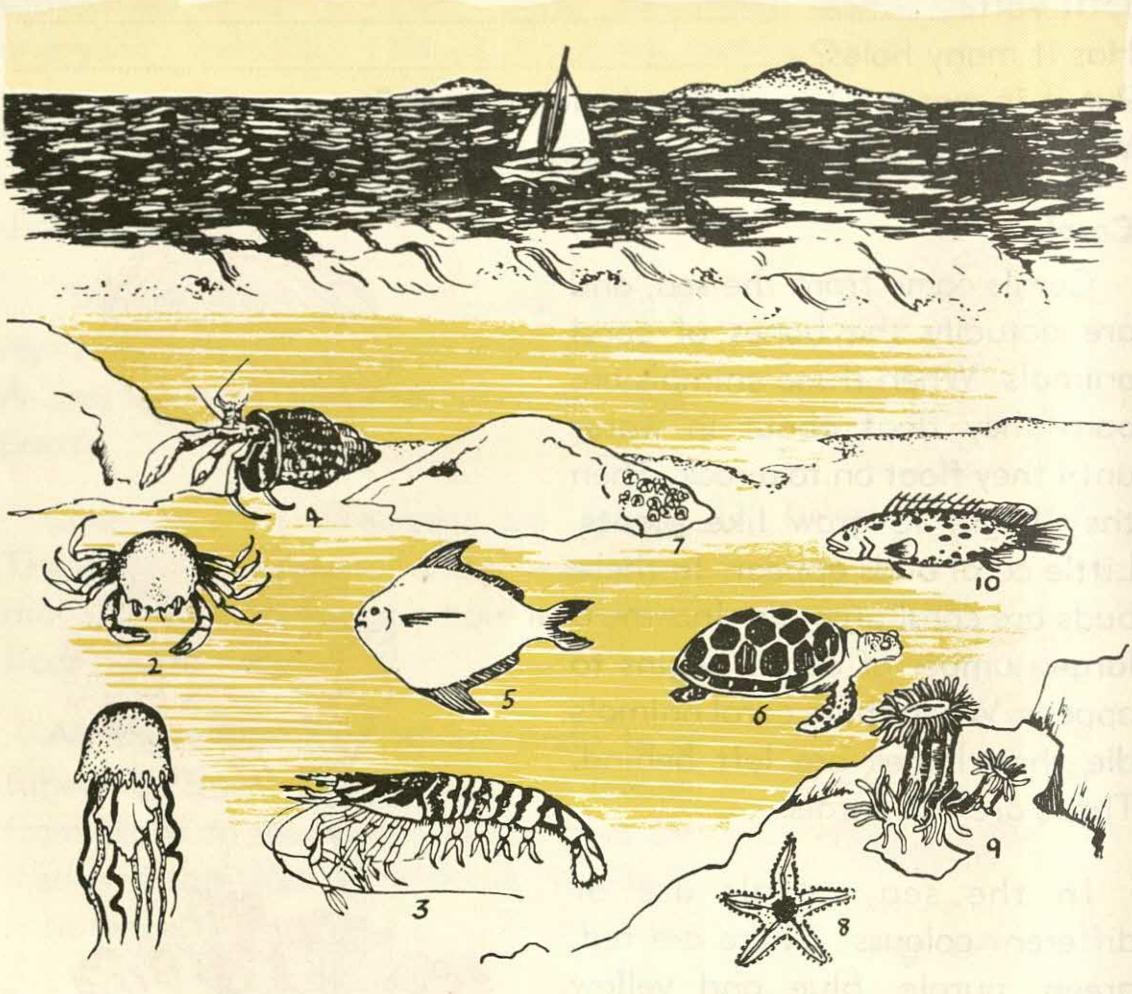


Fig. 66

1. ....

2. ....

3. ....

4. ....

5. ....

6. ....

7. ....

8. ....

9. ....

10. ....

CHAPTER 10

AIR IS REAL—IT TAKES UP SPACE

There is air all around us though we cannot see it or touch it. You can feel it when you wave your hand in front of your face. You can also see how things are moved by air.

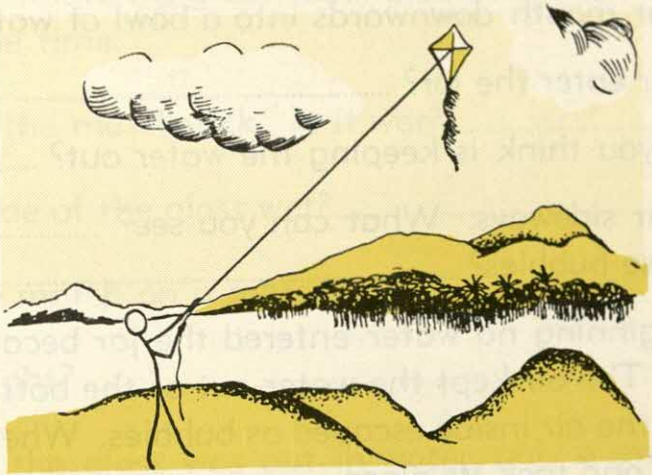


Fig. 67

The drawing shows Abdul flying a kite. It is the wind that pushes up the kite. But wind is moving air. It is the moving air that blows the leaves off trees and carries them to far-away places. Hence we say that air is something real, something that can move from place to place though we cannot see it.

Air is everywhere. There is air in a cupboard, inside a desk, in an ink bottle, in a hole in the ground. Whenever there is space near the earth there is air. Air is important to us in many ways. We breathe in air; animals and plants breathe in air. A bird flies by pushing its wings against the air around it. If there were no air, no birds or aeroplanes could fly. All living things would die.

The following experiments will show how air takes up space.

Things to do:

Take an empty jam jar or bottle. Is it really empty? Is there something inside it that we cannot see?

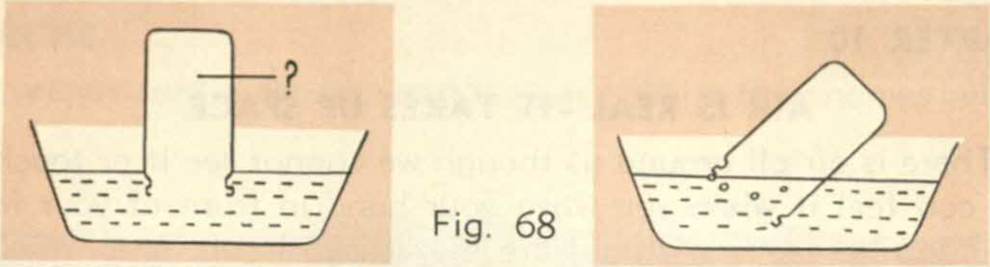


Fig. 68

Put the jar mouth downwards into a bowl of water.

Does water enter the jar? ....

What do you think is keeping the water out? ....

Tilt the jar sideways. What can you see? ....
What are these bubbles? ....

In the beginning no water entered the jar because there was air in the jar. The air kept the water out of the bottle. When you tilted the jar, the air inside escaped as bubbles. When air escaped, water entered and took its place.

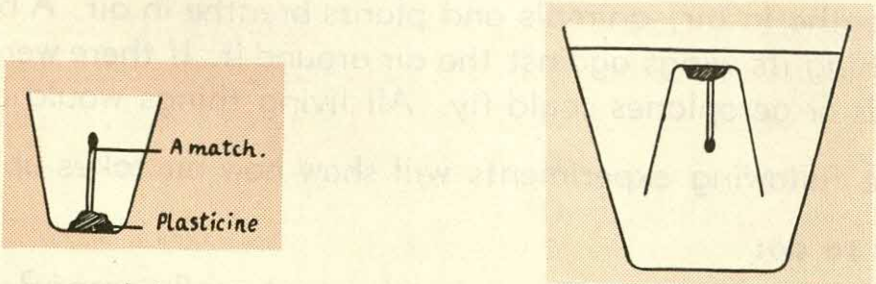
Here is another experiment you can do at home or in class. This experiment also shows that air takes up space.

Things to get:

A box of matches, a drinking glass or jam jar, a piece of plasticine and a bucket of water.

Things to do:

Stick a matchstick in the bottom of the glass or jar with plasticine (See figure 69a)



(a) (b)

Fig. 69

Now put the glass, mouth downwards, into the bucket of water. Push it right in so that the glass is totally in water. (See figure 69b)

Does water enter the glass? ....

Carefully remove the glass making sure that you keep the glass upright all the time.

Take out the matchstick. It it wet? ....

Is the inside of the glass wet?..

Strike the match on a matchbox.

Does it light? ....

Although the glass was put in water, only a small amount of water entered it because there was air in the glass. Air takes up some of the space in the glass.

Air has weight

We have learnt that air takes up space. Another thing about air is that it has weight. Again we cannot feel the weight of air pressing down on us. But we can prove by a simple experiment that air has weight.

Which would you rather carry, a box of books or a box of air? Of course you would certainly want to carry the box of air, for it would be much lighter than the box of books. A box of air may not weigh very much but a roomful of air would weigh several kilos. How is this?

As we have learnt earlier, the earth is surrounded by a layer of air. This layer of air is called the atmosphere. It is several kilometers thick.

EXPERIMENT

To show that air has weight.

Things to get:

A football bladder, a piece of long stick, a metal weight and a rod.

Things to do:

Balance the stick on a rod with the empty football bladder and the metal weight on opposite ends of the rod as you can see in the diagram. Mark the position of the bladder, the weight and the rod on the stick.

Now blow up the football bladder with a pump so that it is full of air and fasten the opening securely. See if it still balances the weight, when the bladder, the rod the weight are in the same places as before.

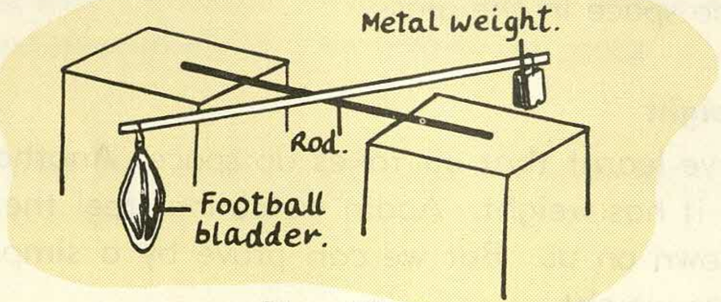


Fig. 70

Is the stick straight? ....

Is the weight on one side the ....
same as the other? ....

Which side of the stick is heavier after the football bladder has been blown up? ....

Does this show that air has weight? ....

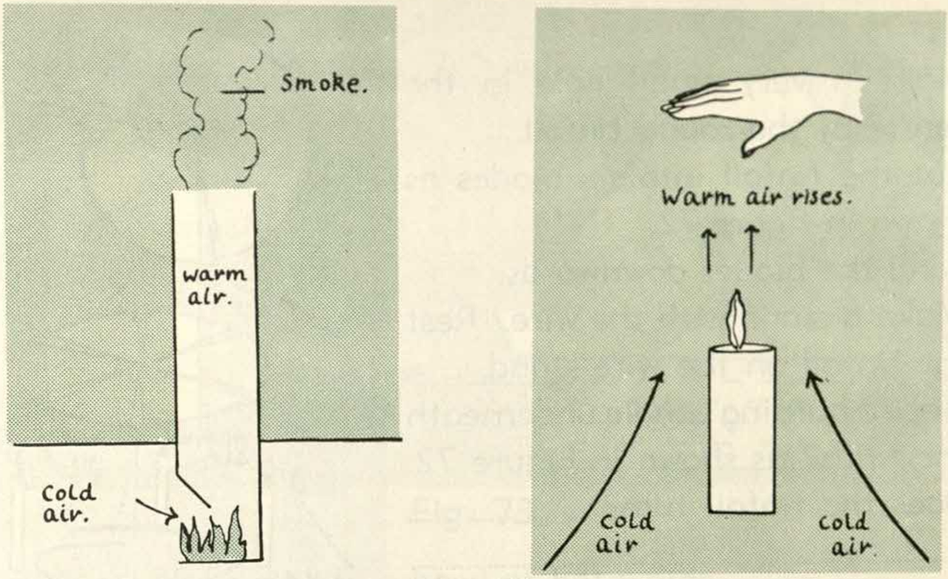


Fig. 71

WARM AIR AND COLD AIR

Air is always moving from place to place. You will find that warm air is lighter than cold air. Cold air from below pushes up the warm so that it is forced to rise. That is why on a still day we see smoke from a chimney rising into the sky. Smoke is made up of fine solid particles, and these particles are pushed up by the warm air from the fire.

EXPERIMENT 1

Get a candle. Light it, and place your hand at the side of the candle below the flame. Is it warm? ....
Now place your hand above the flame. Is it warm? ....
You will find that air around a candle is cold; but the air above the candle flame is warm. Cold air from below forces the warm air to rise above the candle.

EXPERIMENT 2

To show that warm air rises,

Things to get:

A candle, a round piece of tinfoil, a pair of scissors, and a piece of wire.

Things to do:

1. Make a very small hole in the centre of the round tinfoil.
2. Cut the tinfoil into six blades as shown in figure 72.
3. Bend the blades downwards.
4. Make a stand with the wire. Rest the tinfoil on the wire stand.
5. Place a burning candle underneath the tinfoil as shown in Figure 72. Does the tinfoil turn? ....

   ....

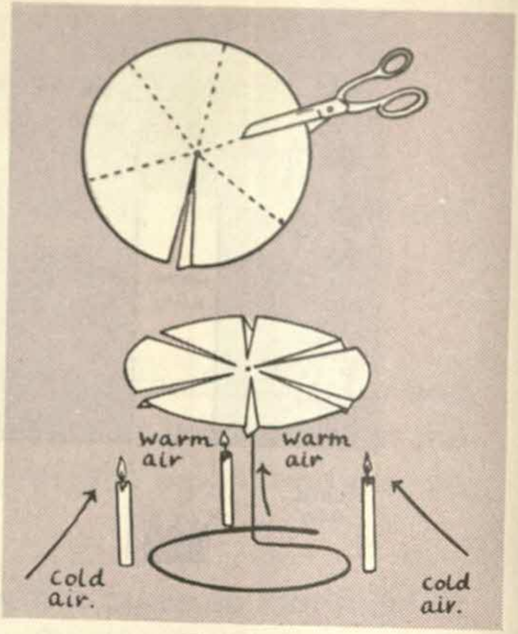


Fig. 72

The air that is above the candle becomes warm. When air is warmed, it is forced to rise. This pushes against the blades of the foil, making it turn.

Air expands

When air is warmed it **expands.** Expansion means that it takes up more space. When air is cooled, it **contracts.** Contraction means that is takes up less space.

The experiment below will help you to understand how air expands when it is warmed and contracts when it is cooled.

EXPERIMENT

To show that air expands when warmed and contracts when cooled.

Things to get:

A bottle, a balloon, a rubber band and a bowl of hot water.

Things to do:

1. Fit the balloon over the mouth of the bottle. Tighten it with a piece of rubber band as shown in the figure on the left Is there air in the bottle? ....

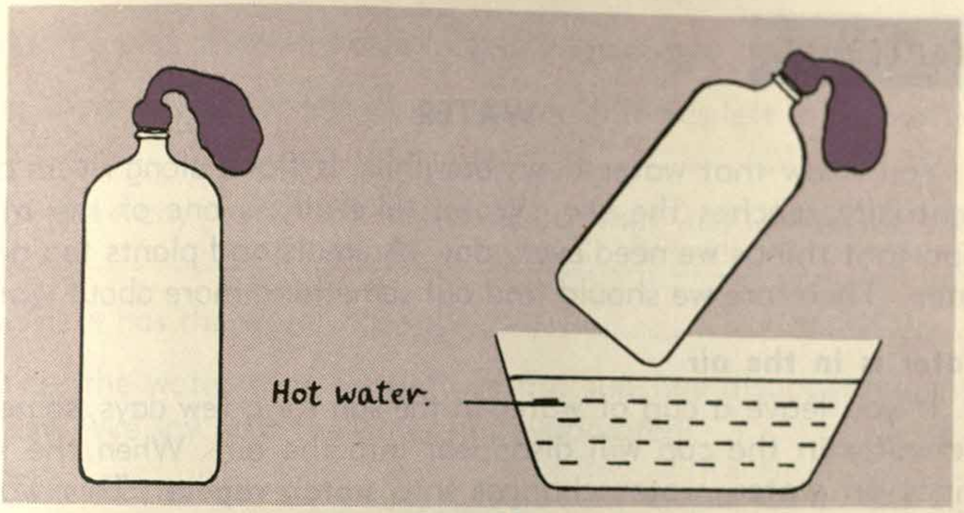


Fig. 73.

2. Now place the bottle in a bowl of hot water.
   What happens to the baloon? ....
   Where does the air that fills the baloon come from?
   ....
   Does this show that when air is warmed it takes up more space?
   ....
   Make a drawing to show the end of your experiment.

3. Remove the bottle from the bowl of hot water and leave it on the table for some time.
   What happens? ....
   Where has the air in the balloon gone to?
   ....
   Does this show that when air is cooled it takes up less space?
   ....

CHAPTER 11

WATER

You know that water flows downhill. It flows along rivers and eventually reaches the sea. Water, like air, is one of the most important things we need every day. Animals and plants too need water. Therefore we should find out something more about water.

Water is in the air

If you leave a cup of water in the sun for a few days, some of the water in the cup will disappear into the air. When the sun shines on water, water changes into **water vapour.** This water vapour is light and mixes with the air so that we cannot see it. When water changes into water vapour we say that water **evaporates.**

More water evaporates on a hot day than on a cool day.

Experiment 1 shows that water evaporates faster on a hot day.

WATER EVAPORATES

EXPERIMENT 1

Things to do:

1. Get two small saucers. Put a teaspoon of water in each.
2. Put one in the nature corner, put the other in the sun. Leave them there for three hours.

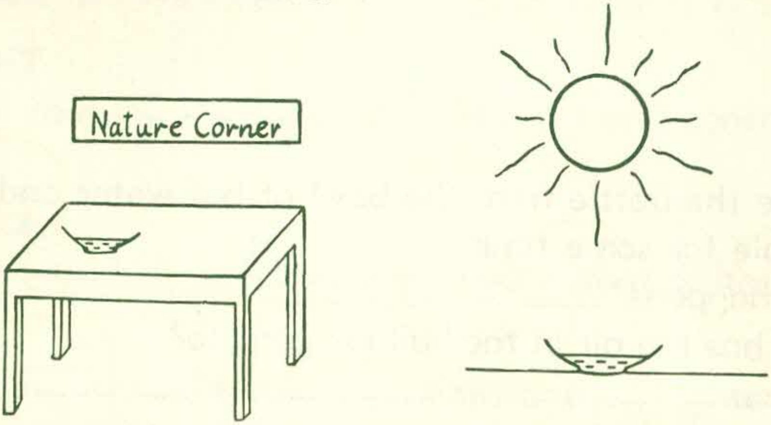


Fig. 74

3. At the end of three hours look at the saucers.

Is there any water left in the saucer that was left in the nature corner? ....

Is there any water left in the saucer that was left in the sun?

....

Where has the water gone to? ....

Yes, the water that was left in the sun has disappeared into the air. We say that the water has evaporated.

The heat of the sun helps the water to evaporate in very tiny drops of water. This is called water vapour.

Though we cannot see it, there is always water vapour. This water vapour comes from water in the streams, rivers, lakes and sea that is heated by the sun.

Water is a wonderful thing. When you put some in a cup in an ice-box or a refrigerator, it becomes ice. Ice is actually water in a solid form.

When the ice is taken out and left in the open for some time, it melts and becomes water again. If you put this in a kettle and heat it over a fire, water boils and changes to **steam** or water vapour.

The steam can be caught on a cool surface, where it condenses and becomes water again.

From this we know that water can be a solid, a liquid and a gas (steam).

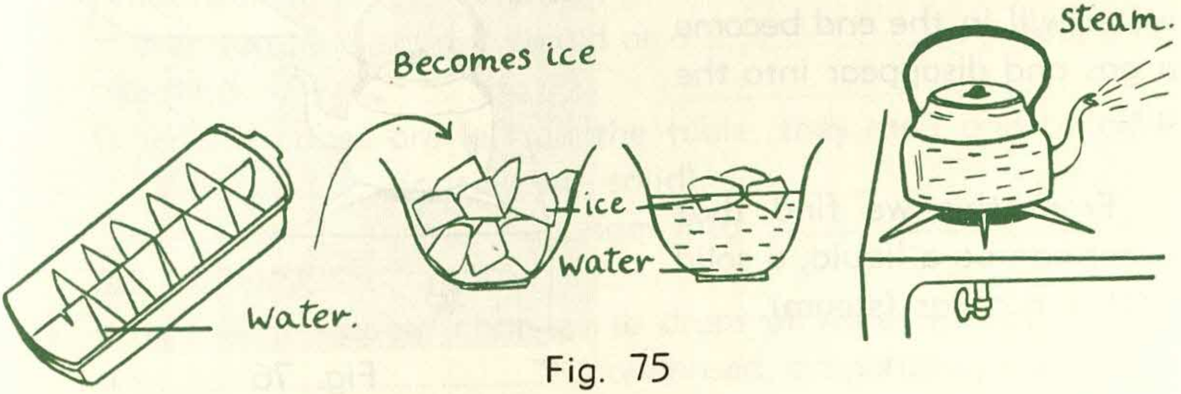


Fig. 75

WATER CAN BE A SOLID, A LIQUID AND A GAS

Things to do:

Fill a container with water.

Put it in the ice box.

After a few hours what happens to the water? ....

....

Yes, the water has become solid ice. So water has changed to a solid.

Put the block of ice in a bowl. Leave it on the table for some time.

What is formed on the outside of the glass? ....

What has happened to the solid ice? ....

Put the ice water in a kettle. Boil it.

When it is boiling, place a piece of glass near the spout as shown.

What is formed on the glass? ....

If you keep on boiling, water will in the end become a gas and disappear into the air.

From this we find that water can be a liquid, a solid (ice) and a gas (steam).

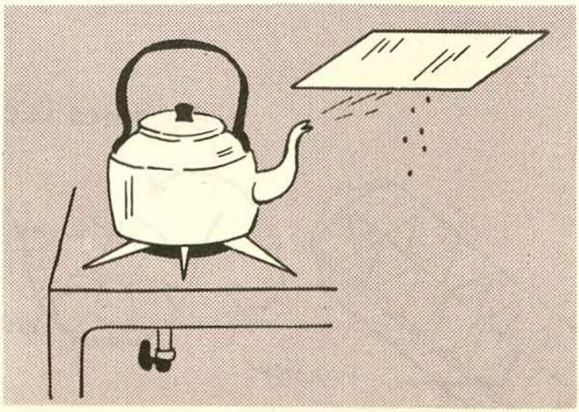


Fig. 76

HOW IS RAIN FORMED?

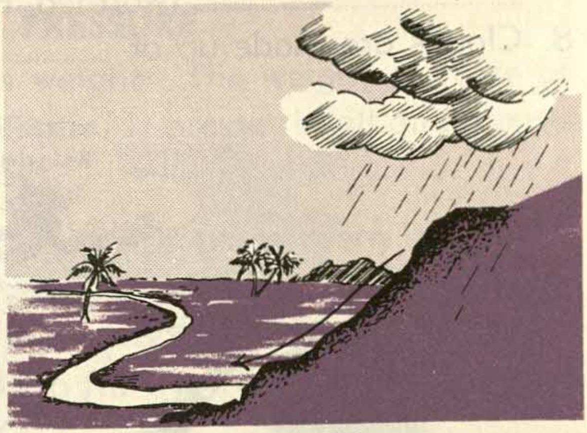


Fig. 77

Rain falls from the sky; it falls on the earth and sinks into the ground. Some of the water flows down mountains or hills to become streams and rivers. These flow along the lowland and through the valleys. Some water flows to the sea. We have learnt that the sun helps to change water into water vapour by evaporation. Therefore some of the water in the rivers, lakes, and the sea changed into water vapour.

This water vapour rises. When it rises higher and higher it becomes cooled. This makes clouds. When more and more water vapour becomes cooled it condenses into tiny drops of water. These becomes heavy and they fall as rain.

EXERCISE

Fill in the blanks with one word:

1. When water evaporates water has changed into .... (rain, cloud, water vapour)
2. On a hot day .... (more, less) water evaporates than on a cold day.
3. Water can be a solid, a liquid or a .... (wood, gas, sweet).
4. When ice cubes are left on the table, they melt and become .... (gas, water, solid).
5. When water is boiled, it changes into .... (air, water vapour, rain).
6. When water vapour changes to drops of water we say that it has .... (condensed, evaporated, melted).

7. When water vapour rises higher and higher it becomes .... (warmed, heated, cooled).
8. Clouds are made up of .... (air, water vapour, rain).

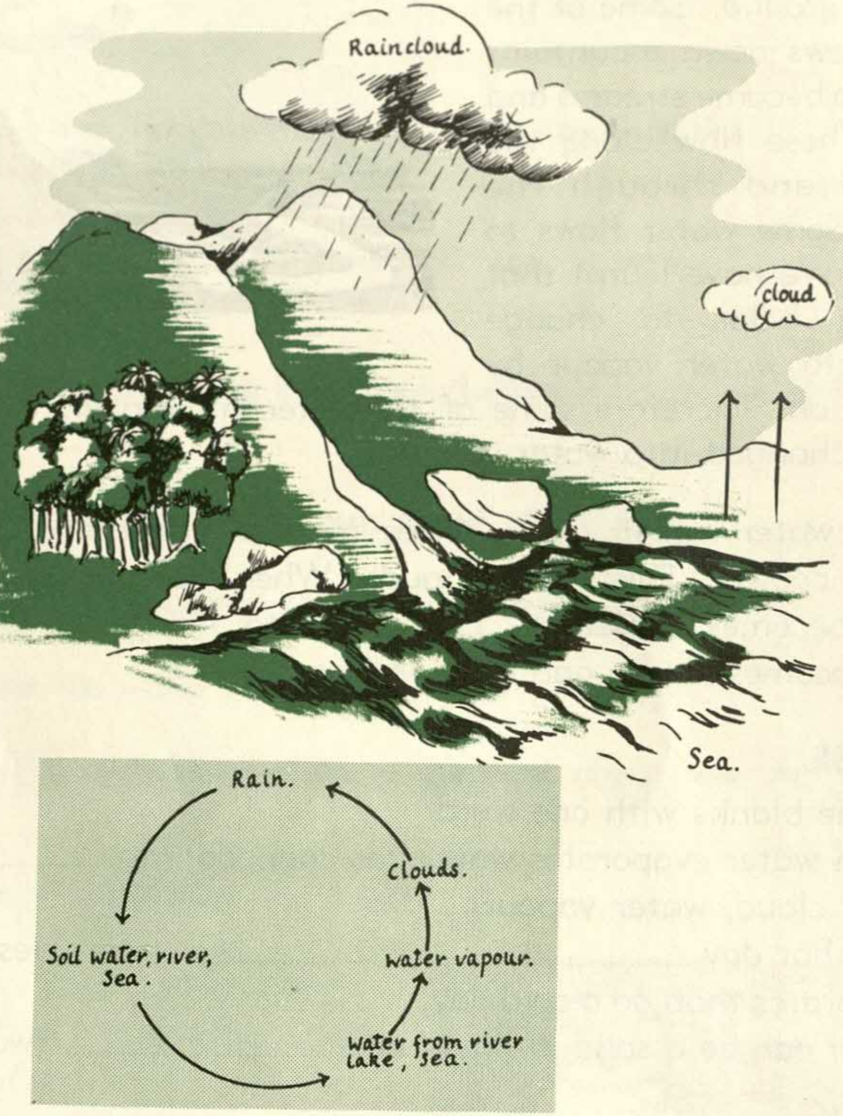


Fig. 78

Drawn here is a diagram to show how water from the sea and lake becomes rain. Colour the sea blue, the heavy clouds black and the hills grey. Write the words water vapour, river, rain and hill.

CHAPTER 12

AIR HAS PRESSURE

We have learned that air has weight. The weight or force of air pressing on us is called **air pressure.** It presses in all directions–upwards, downwards, and sideways.

You will find that air pressure helps us in many ways. Air pressure pushes the water up a straw when we drink from a straw. There is air pressure pressing on the surface of ink in an ink bottle. It is this pressure that pushes ink to fill the ink bag in a fountain pen.

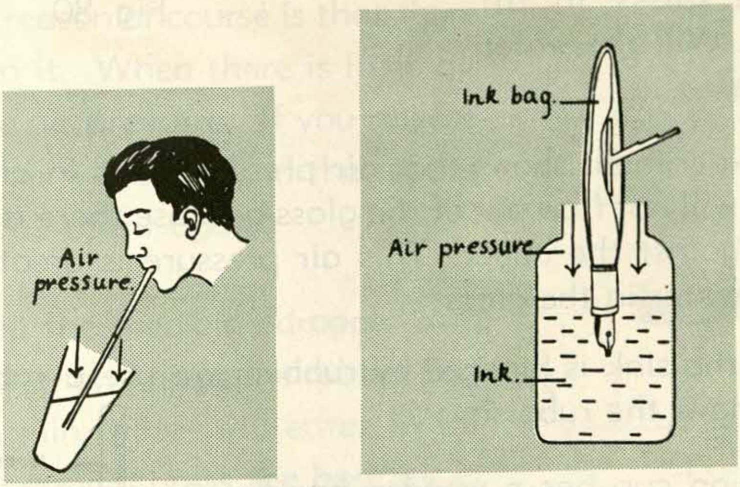


Fig. 79

Here is an experiment to show the pressure of the air. You need a drinking glass and a piece of paper (any bottle will do if you cannot get a drinking glass). Fill the glass with water up to the top. Place the paper over the top of the glass as you can see in figure 80. Press the paper against the mouth and carefully turn the glass upside down.

Slowly remove your hand. Will the water flow out? ....
Turn the glass in all directions. Will the water flow out? ....

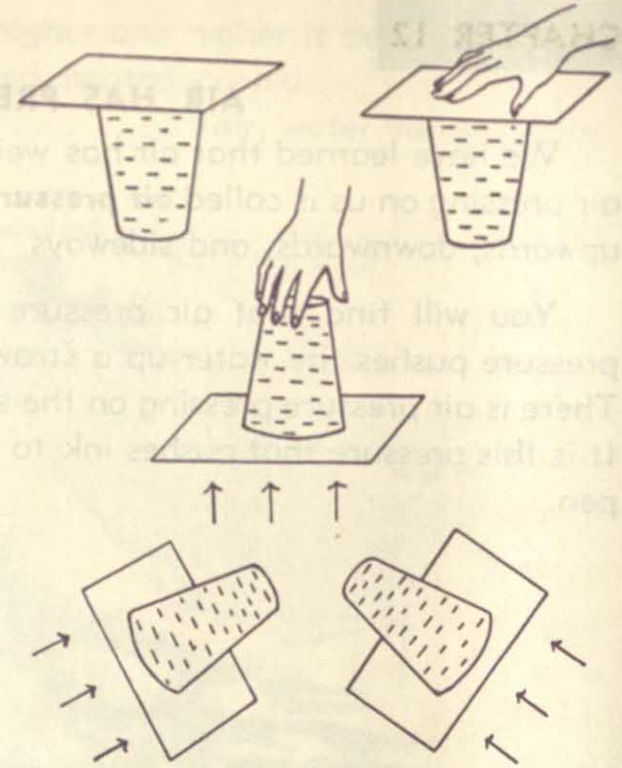


Fig 80

This experiment shows that air pressure acts in all directions. The water will not flow out of the glass because there is air pressure pressing against the paper. This air pressure is greater than the weight of water in the glass.

When the sink is blocked by rubbish we use a rubber suction cup to remove the rubbish.

A suction cup has a wooden handle with a rubber cup at the end of it.

When the cup is pressed against a piece of board, for example, the air between the cup and the surface of the board is squeezed out.

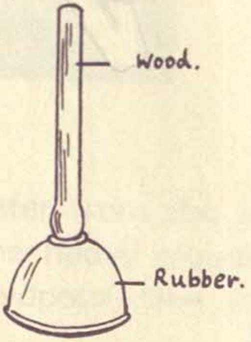
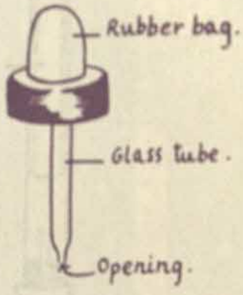


Fig. 81

Air from the outside presses against the outside of the rubber cup. You can then lift up the piece of board.

Try this experiment with a rubber suction cup yourself.

This is a medicine dropper. It has a rubber bag and a small glass tube. The tube has a small opening. Does the rubber bag contain air? ....



A medicine dropper.

When you press the rubber bag the air within is driven out. If you hold your finger over the opening, no air can get into the rubber bag. The bag would look like the one shown here. Why does not the rubber bag become the same as before? The reason of course is that there is little air in it. When there is little air there is little air pressure. If you release your finger, air will enter and the rubber bag will be full of air again.

If you dip the medicine dropper into a basin of water and press the rubber bag and let go again, water will enter to fill the bag. When you press the bag, air is driven out and the air pressure inside becomes less than the air pressure pressing on the surface of the water. Hence water rises up the tube because the pressure of the air in it is less than at the surface of the water.

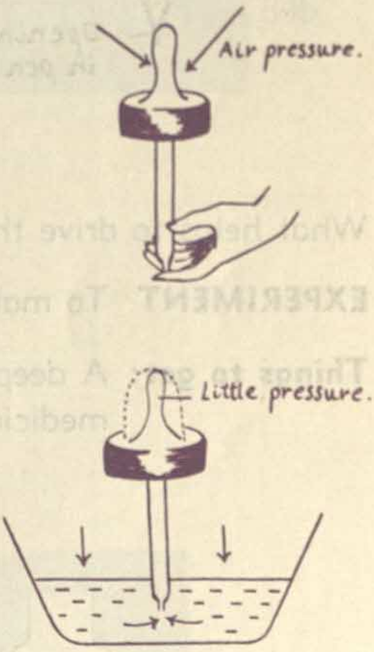


Fig. 82

From this we know that air pressure helps us to fill a medicine dropper. In the same way the pump of a fountain pen is also filled by air pressure. The drawings below show how it is done.

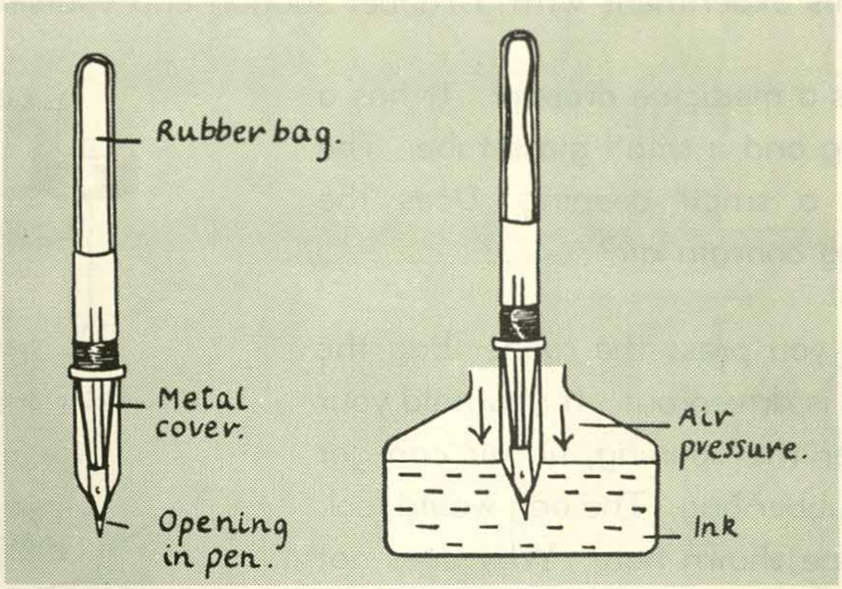


Fig. 83

What helps to drive the ink into the rubber bag? ....

EXPERIMENT To make a chicken fountain.

Things to get: A deep saucer, a bottle, two clothes pegs and a medicine dropper.

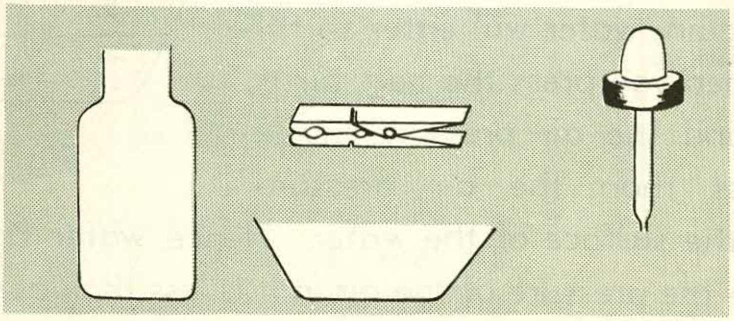


Fig. 84a

1. Fill the saucer and bottle with water. The water in the bottle must come up to the brim.
2. Cover the bottle with a piece of cardboard and slowly invert it in the saucer. Then remove the piece of cardboard. Is there any air in the bottle? ....
Is there any pressure pressing on the surface of the water in the saucer? ....
3. Slowly raise the bottle a little and rest it on two clothes pegs as shown.
4. Remove water from the saucer with the medicine dropper.
5. Does water come out of the bottle? ....
....

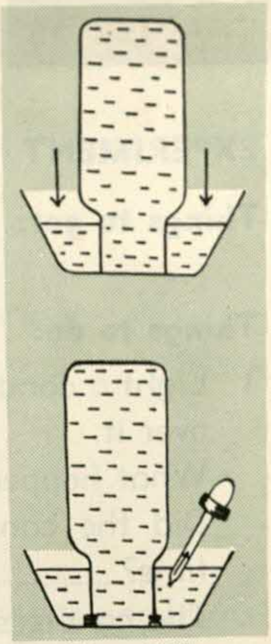


Fig. 84b

AIR IS NEEDED FOR BURNING

EXPERIMENT To show that air is needed for burning.

Things to get: A chimney glass, a candle, a box of matches, two clothes pegs and a jam jar.

Things to do:

1. Light a candle. Place the jam jar over it.
   What happens? ....
   Did the candle burn for a long time? ....
   The candle stops burning after a few seconds. The candle can burn for a few seconds only because there is very little air in the bottle. For a candle to keep on burning there must be air all the time. Try the experiment below. This time instead of using a jam jar, use a chimney glass. A chimney glass has openings at both ends. Light the candle. Place the clothes pegs near the candle. Now place the lamp chimney over the candle so that it rests on the clothes pegs. Will the candle stop burning? ....
   ....
   Do you know why? ....
   Yes, the candle will keep on burning because there is air going into the lamp chimney from below.

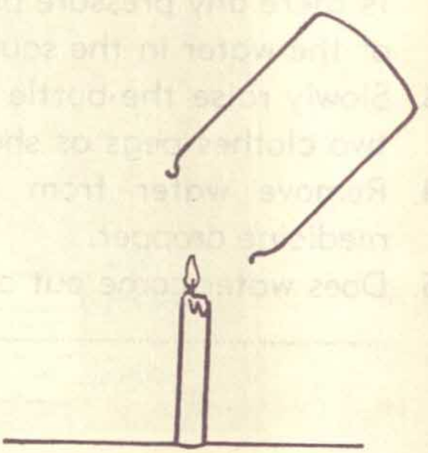


Fig. 85

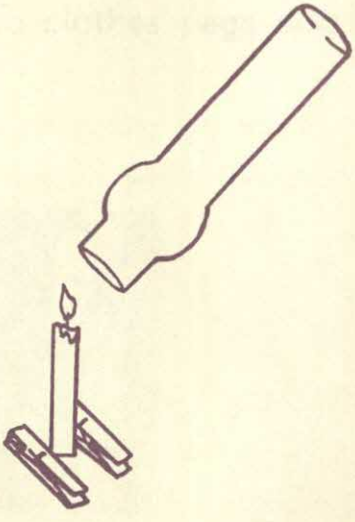


Fig. 86

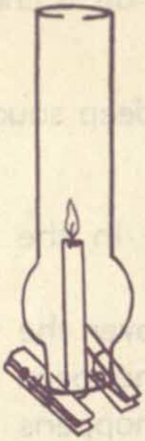


Fig. 87

EXPERIMENT To show that air is changed when something burns in it.

Things to get: A jam jar, a piece of carboard, a piece of wire and a watch.

Things to do:

1. Tie the candle to the piece of wire as shown.
2. Light the candle. Place the burning candle in the jam jar. Cover the jar with the piece of cardboard. Note how long the candle burns in the jar. The candle burns for .... seconds.
3. Slide the cardboard to one side and remove the candle. Replace the cardboard.
4. Light the candle. Slide the cardboard to one side and put the burning candle into the jar. Note how long the candle burns. The candle burns for .... seconds.

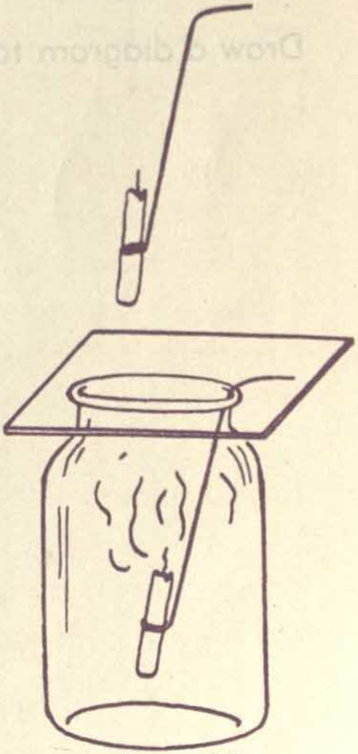


Fig. 88

EXPERIMENT To show that air is changed when something burns in it.

Things to get: A jam jar, a deep saucer of water and a candle.

Things to do:

1. Place the burning candle in the saucer of water.
2. Slowly place the jam jar over the burning candle. See what happens to the candle and what happens to the water in the jar.
   Does the candle go out? ....
   What enters the jar? ....

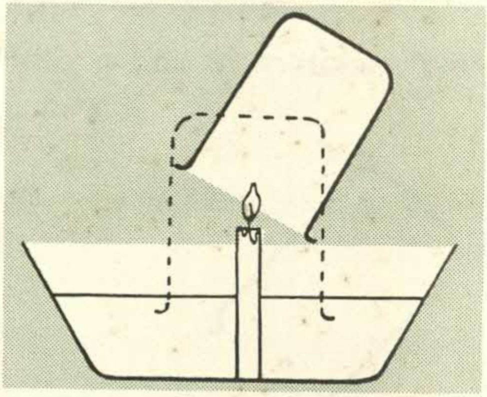


Fig. 89

When the jar was placed over the burning candle it went out. Part of the air is used up by the burning candle. Water enters the jar to fill the space.

Draw a diagram to show the end of your experiment.

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